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BIOMETRIKA

SOME PROPERTIES OF "STUDENT'S" z: CORRELATION, REGRESSION AND SCEDASTICITY OF z WITH THE MEAN AND STANDARD DEVIATION OF THE SAMPLE.

BY KARL PEARSON, F.R.S.

1. As in my previous article* I shall take $\bar{x}$ to be the mean and σ the standard deviation in the sample, while m and Σ are the corresponding quantities in the parent-population supposed normal, and $z=(\bar{x}-m)/\sigma$. Since $\bar{x}$ and σ are independent of one another, the surface for the distribution of z with $\bar{x}$ and σ consists of the product of their two distribution curves, or if w be the ordinate,

$$w = w_0\, e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}\, e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}}\, \sigma^{n-2} \quad [d\bar{x}\, d\sigma] \quad \ldots\ldots\ldots\ldots\ldots\text{(i)}.$$

Integrating out for a total number N of samples of size n,

$$N = \int_{-\infty}^{\infty} d\bar{x} \int_0^{\infty} d\sigma\, w_0 e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}\, e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}}\, \sigma^{n-2}$$

$$= w_0 \sqrt{2\pi}\, \frac{\Sigma^n}{n^{\frac{1}{2}n}}\, 2^{\frac{1}{2}(n-3)}\, \Gamma\left(\tfrac{1}{2}(n-1)\right) \ldots\ldots\ldots\ldots\text{(ii)},$$

which determines w_0.

2. *Correlation, Regression and Scedasticity of z and $\bar{x}$.*

Since the mean of z is zero, we require, in order to ascertain the correlation coefficient $r_{\bar{x}z}$, to find

$$p_{\bar{x}-m,\, z} = \frac{w_0}{N} \int_{-\infty}^{+\infty} d\bar{x} \int_0^{\infty} d\sigma\, w\, (\bar{x}-m)\, z$$

$$= \frac{w_0}{N} \int_{-\infty}^{+\infty} (\bar{x}-m)^2\, e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}\, d\bar{x} \int_0^{\infty} e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}}\, \sigma^{n-3}\, d\sigma$$

$$= \frac{w_0}{N} \sqrt{2\pi}\, \frac{\Sigma}{\sqrt{n}}\, \frac{\Sigma^2}{n} \int_0^{\infty} e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}}\, \sigma^{n-3}\, d\sigma.$$

Making the transformation $v = \frac{1}{2}n\sigma^2/\Sigma^2$ we find

$$p_{\bar{x}-m,\, z} = \frac{w_0}{N} \frac{\sqrt{2\pi}\, \Sigma^{n+1}\, 2^{\frac{1}{2}(n-4)}}{n^{\frac{1}{2}(n+1)}}\, \Gamma\left(\tfrac{1}{2}(n-2)\right) \quad \ldots\ldots\ldots\ldots\text{(iii)},$$

or substituting for w_0 from (ii),

$$p_{\bar{x}-m,\, z} = \frac{\Sigma}{\sqrt{n}}\, \frac{1}{\sqrt{2}}\, \frac{\Gamma\left(\tfrac{1}{2}(n-2)\right)}{\Gamma\left(\tfrac{1}{2}(n-1)\right)}.$$

* *Biometrika*, Vol. XXII. pp. 405—422.

Since $\sigma_z = 1/\sqrt{n-3}$ and $\sigma_{\bar{x}} = \Sigma/\sqrt{n}$,

$$r_{\bar{x}z} = \frac{p_{\bar{x}-m,\,z}}{\sigma_z \sigma_{\bar{x}}} = \sqrt{\frac{n-3}{2}}\,\frac{\Gamma(\frac{1}{2}(n-2))}{\Gamma(\frac{1}{2}(n-1))} \quad \text{.....(iv).}$$

As $n \to \infty$ the function of n on the right-hand side of (iv) $\to \sqrt{1-\frac{1}{2(n-2)}}$. For $n = 100$ this is practically the true value ·9974. We have indeed

$n=$	5	10	50	100
$r_{\bar{x}z}$	·8862	·9650+	·9948	·9974

Thus the correlation between $\bar{x}$ and z is extremely close, and by the time $n = 10$ it is for practical purposes almost perfect. We now turn to the regression curve of z on $\bar{x}$. It is necessary to find $\bar{z}_{\bar{x}}$, the mean of z in an array of z's corresponding to a given $\bar{x}$. Since $\bar{x}$ follows a normal curve, the number of z's $n_{z_{\bar{x}}}$ corresponding to a given strip between $\bar{x}$ and $\bar{x} + \delta\bar{x}$ is

$$n_{z_{\bar{x}}} = \frac{N}{\sqrt{2\pi}}\,\frac{1}{\Sigma/\sqrt{n}}\,e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}\,d\bar{x} \quad \text{.....(v).}$$

But if we integrate to find mean of array

$$n_{z_{\bar{x}}} \times \bar{z}_{\bar{x}} = w_0 \int_0^\infty e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}}\,\sigma^{n-3}\,d\sigma\; e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}\,(\bar{x}-m)\,d\bar{x}$$

$$= w_0\,(\bar{x}-m)\,e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}\,\frac{\Sigma^{n-2}\,2^{\frac{1}{2}(n-4)}}{n^{\frac{1}{2}(n-2)}}\,\Gamma(\tfrac{1}{2}(n-2))\,d\bar{x}.$$

Dividing by (v) we have, on substituting for w_0 from (ii),

$$\bar{z}_{\bar{x}} = \frac{\bar{x}-m}{\Sigma/\sqrt{n}}\,\frac{1}{\sqrt{2}}\,\frac{\Gamma(\frac{1}{2}(n-2))}{\Gamma(\frac{1}{2}(n-1))} \quad \text{.....(vi),}$$

or, the regression is linear.

Actually we may write the regression line

$$\bar{z}_{\bar{x}} - \bar{z} = \frac{\sigma_z}{\sigma_{\bar{x}}}\,r_{\bar{x}z}\,(\bar{x}-m) \quad \text{.....(vii),}$$

and substituting $\bar{z} = 0$, $\sigma_z = 1/\sqrt{n-3}$, $\sigma_{\bar{x}} = \Sigma/\sqrt{n}$ and $r_{\bar{x}z}$ = its value from (iv), we reach

$$\bar{z}_{\bar{x}} = \frac{1}{\sqrt{n-3}}\,\frac{1}{\Sigma/\sqrt{n}}\sqrt{\frac{n-3}{2}}\,\frac{\Gamma(\frac{1}{2}(n-2))}{\Gamma(\frac{1}{2}(n-1))}\,(\bar{x}-m),$$

which agrees with (vi) and indicates that the regression is not only linear but of the usual type. We could not start from (vii) as we had not shown that the regression was really linear, but the approach of $r_{\bar{x}z}$ to unity indicated that there was not much elbow room left for $\eta_{z\cdot\bar{x}}$ or the regression must be *nearly* linear. It is actually linear.

We now ask if the distribution of an array be such that its variance is given by $\sigma_z^2(1-r_{\bar{x}z}^2)$, i.e. is the system homoscedastic? We need to evaluate

$$n_{z_{\bar{x}}}\times(\sigma_{z_{\bar{x}}}^2+\tilde{z}_x^2)=\int_0^\infty wz^2d\sigma=w_0(\bar{x}-m)^2e^{-\frac{1}{2}\frac{n(\bar{x}-m)}{\Sigma^2}}d\bar{x}\int_0^\infty e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}}\sigma^{n-4}d\sigma.$$

Making the same transformation as before, i.e. $v=\frac{1}{2}n\sigma^2/\Sigma^2$, we find

$$n_{z_{\bar{x}}}\times(\sigma_{z_{\bar{x}}}^2+\tilde{z}_x^2)=w_0(\bar{x}-m)^2e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}}d\bar{x}\,\frac{\Sigma^{n-3}2^{\frac{1}{2}(n-5)}}{n^{\frac{1}{2}(n-3)}}\Gamma(\tfrac{1}{2}(n-3)),$$

or dividing by (v) and substituting for w_0 from (ii)

$$\sigma_{z_{\bar{x}}}^2+\tilde{z}_x^2=\frac{(\bar{x}-m)^2}{\Sigma^2/n}\,\frac{1}{n-3}\quad\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(viii)}.$$

Now using (vi) we have

$$\sigma_{z_{\bar{x}}}^2=\frac{(\bar{x}-m)^2}{\Sigma^2/n}\left(\frac{1}{n-3}-\frac{1}{2}\frac{\Gamma^2(\frac{1}{2}(n-2))}{\Gamma^2(\frac{1}{2}(n-1))}\right)$$

$$=\frac{(\bar{x}-m)^2}{\Sigma^2/n}\left(\frac{1}{n-3}\right)\left(1-\frac{\Gamma^2(\frac{1}{2}(n-2))}{\Gamma(\frac{1}{2}(n-1))\,\Gamma(\frac{1}{2}(n-3))}\right)\quad\ldots\ldots\text{(ix)}.$$

Thus we see that the distribution is *not* homoscedastic; the variance is given by a parabola and the array standard deviation by two sloping lines. Clearly the right unit to measure $\sigma_{z_{\bar{x}}}$ by is the total standard deviation of z, i.e. $1/\sqrt{n-3}$. Thus expressed we obtain

$$\frac{\sigma_{z_{\bar{x}}}}{\sigma_z}=\frac{|\bar{x}-m|}{\sigma_{\bar{x}}}\sqrt{1-\frac{\Gamma^2(\frac{1}{2}(n-2))}{\Gamma(\frac{1}{2}(n-1))\,\Gamma(\frac{1}{2}(n-3))}}$$

We have the following numerical results.

Values of $\sigma_{z_{\bar{x}}}/\sigma_z$.

	$(\bar{x}-m)/\sigma_{\bar{x}}$							
n	0·5	1·0	1·5	2·0	2·5	3·0	3·5	$\sigma_z=\frac{1}{\sqrt{n-3}}$
5	·23163	·46325+	·69488	·92650+	1·15813	1·38975+	1·62138	·70711
10	·14993	·29986	·44979	·59972	·74964	·89957	1·04950+	·37796
25	·07494	·14988	·22482	·29975+	·37469	·44963	·52457	·21320
50	·05143	·10287	·15430	·20573	·25716	·30860	·36003	·14586[5]
100	·03581	·07162	·10743	·14324	·17905	·21486	·25067	·10153

When n is considerable

$$\sqrt{1-\frac{\Gamma^2(\frac{1}{2}(n-2))}{\Gamma(\frac{1}{2}(n-1))\,\Gamma(\frac{1}{2}(n-3))}}=\sqrt{\frac{1}{2(n-2)}+\frac{3}{8}\frac{1}{(n-2)^2}}\ \text{nearly}$$

$\ldots\ldots\text{(x)}.$

For example, when $n=100$, this expression takes the value ·07162, in agreement with the value obtained from the Γ-functions in the table above. Even for $n=50$,

we have the value ·10286 differing only a unit in the fifth decimal from the value in the table above. The table shows that for a given value of the sample mean the distribution of z is very heteroscedastic, and that for small samples and not extremely high values of $(\bar{x}-m)/\sigma_{\bar{x}}$ the value of the standard deviation may approach or even exceed the total variation, σ_z of z.

We may consider the subject from another standpoint. The frequency surface of $\bar{x}$ and σ is

$$w = w_0 e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}} e^{-\frac{n\sigma^2}{2\Sigma^2}} \sigma^{n-2} \quad [d\bar{x}\, d\sigma].$$

Replacing σ by $(\bar{x}-m)/z$, this surface becomes

$$w = w_0 e^{-\frac{1}{2}\frac{n(\bar{x}-m)^2}{\Sigma^2}\left(1+\frac{1}{z^2}\right)} \left(\frac{\bar{x}-m}{z}\right)^{n-2} \left(-\frac{\bar{x}-m}{z^2}\right) \quad [d\bar{x}\, dz],$$

with integration of z from ∞ to 0.

Or, if we write $\gamma^2 = \dfrac{n(\bar{x}-m)^2}{2\Sigma^2}$, the curve of distribution of z for a given $\bar{x}$ is

$$w = d\bar{x}\, w_0' e^{-\gamma^2/z^2} \frac{1}{z^n} \quad [dz] \quad \ldots\ldots\ldots\ldots\ldots\ldots\text{(xi)}.$$

Accordingly this is the curve* taken by arrays of z corresponding to a given $\bar{x}$. Now σ is always positive, hence for $\bar{x}-m$ positive z can only take the values 0 to ∞, and for $\bar{x}-m$ negative z can only take negative values from 0 to $-\infty$. Hence, if we write $z' = -z$, we shall obtain the same equations for finding the moment coefficients on either side of the parental mean m, but the curves will be reversed in skewness. If $n_{z_{\bar{x}}} d\bar{x}$ denote the frequency of the array of z on the strip $d\bar{x}$ and ν_p' the pth moment coefficient about $z=0$, we have

$$n_{z_{\bar{x}}} \nu_p' = w_0' \int_0^\infty e^{-\gamma^2/z^2} z^{p-n} dz.$$

Write $v = \gamma^2/z^2$ and we find

$$n_{z_{\bar{x}}} \nu_p' = w_0' \int_\infty^0 e^{-v} \gamma^{p-n} v^{\frac{n-p}{2}} (-\tfrac{1}{2}\gamma v^{-\frac{3}{2}})\, dv$$

$$= w_0' \int_0^\infty e^{-v} v^{\frac{n-p-3}{2}}\, dv\, \tfrac{1}{2}\gamma^{p+1-n}$$

$$= w_0' \tfrac{1}{2}\gamma^{p+1-n}\, \Gamma\left(\frac{n-p-1}{2}\right).$$

If $p=0$,

$$n_{z_{\bar{x}}} = w_0' \tfrac{1}{2}\gamma^{1-n}\, \Gamma\left(\frac{n-1}{2}\right).$$

Thus

$$\nu_p' = \gamma^p\, \Gamma\left(\frac{n-p-1}{2}\right) \Big/ \Gamma\left(\frac{n-1}{2}\right) \ldots\ldots\ldots\ldots\text{(xii)}.$$

* This is not one of the Pearson types, but may be reduced to Type V by taking $z^2 = \xi$.

Putting $p =$ successively 1, 2, 3 and 4, we find

$$\nu_1' = \tilde{z}_{\bar{x}} = \frac{\bar{x} - m}{\Sigma/\sqrt{n}} \frac{1}{\sqrt{2}} \Gamma\left(\frac{n-2}{2}\right) \Big/ \Gamma\left(\frac{n-1}{2}\right),$$

which is in agreement with Equation (vi),

$$\nu_2' = \sigma_{z_{\bar{x}}}^2 + \tilde{z}_{\bar{x}}^2 = \gamma^2 \Gamma\left(\frac{n-3}{2}\right) \Big/ \Gamma\left(\frac{n-1}{2}\right) = \frac{2}{n-3}\gamma^2,$$

which is in agreement with Equation (viii),

$$\nu_3' = \gamma^3 \Gamma\left(\frac{n-4}{2}\right) \Big/ \Gamma\left(\frac{n-1}{2}\right) \quad \text{.....(xiii),}$$

$$\nu_4' = \gamma^4 \Gamma\left(\frac{n-5}{2}\right) \Gamma\left(\frac{n-1}{2}\right) \quad \text{.....(xiv).}$$

We shall write for brevity

$$\lambda = \Gamma\left(\frac{n-2}{2}\right) \Big/ \Gamma\left(\frac{n-1}{2}\right) \quad \text{.....(xv).}$$

Then $$\tilde{z}_{\bar{x}} = \gamma\lambda \text{ and } \sigma_{z_{\bar{x}}}^2 = \gamma^2\left(\frac{2}{n-3} - \lambda^2\right),$$

$$\nu_3' = \gamma^3 \frac{2}{n-4}\lambda \text{ and } \nu_4' = \gamma^4 \frac{4}{(n-3)(n-5)}.$$

From these results we can determine β_1 and β_2 for $z_{\bar{x}}$. We have

$$\mu_3 = \nu_3' - 3\nu_2'\nu_1' + 2\nu_1'^3 = \gamma^3 2\lambda \left\{\lambda^2 - \frac{2n-9}{(n-4)(n-3)}\right\} \quad \text{.....(xvi).}$$

Thus $$\beta_1 = \frac{4\lambda^2\left(\lambda^2 - \frac{2n-9}{(n-2)(n-3)}\right)^2}{\left(\frac{2}{n-3} - \lambda^2\right)^3} \quad \text{.....(xvii).}$$

Again

$$\begin{aligned}\mu_4 &= \nu_4' - 4\nu_3'\nu_1' + 6\nu_2'\nu_1'^2 - 3\nu_1'^4 \\ &= \gamma^4\left\{\frac{4}{(n-3)(n-5)} - \frac{8}{n-4}\lambda^2 + \frac{12}{n-3}\lambda^2 - 3\lambda^4\right\} \\ &= \gamma^4\left\{\frac{4}{(n-3)(n-5)} + \frac{4(n-6)\lambda^2}{(n-4)(n-3)} - 3\lambda^4\right\} \quad \text{.....(xviii),}\end{aligned}$$

and thus

$$\beta_2 = \frac{\frac{4}{(n-3)(n-5)} + \frac{4(n-6)\lambda^2}{(n-4)(n-3)} - 3\lambda^4}{\left(\frac{2}{n-3} - \lambda^2\right)^2} \quad \text{.....(xix).}$$

We have here a case which occasionally presents itself, namely the failure of an auxiliary curve based on the normal curve. Theoretically it is impossible for that curve to represent actual data, but the infinite values of the variates occurring in its tails are so extremely improbable that in most cases we have no occasion to trouble about them. But when we proceed to deduce by assuming normality for our material

other distributions from this assumption, we may find ourselves landed in contradictions. Thus, suppose we have a certain parent population and we take samples of *five* from it. We can calculate the mean $\bar{x}$ and the standard deviation σ of these samples and form their z's. We may suppose this done for a very large number of samples so that it is possible to arrange them in groups according to the values of $\bar{x}-m$. Then theoretically the distribution of all these groups will be curves of the same shape*, varying only in size with $\gamma^2=\frac{1}{2}n(\bar{x}-m)^2/(\Sigma^2)$, or with, if we prefer it, the array standard deviation. But the β_2 of all these curves will be infinite. Further, β_1 will be very large, far beyond the range of any experience in ordinary statistical work. In the practical sampling, however, it is not possible, with μ_2 finite, for any μ_4 (or β_2) to be infinite. When n is not less than nor equal to 5, the array curves for relatively small samples, i.e. less, say, than 15, will still have excessive leptotosis and extreme skewness. This is illustrated in the accompanying table.

Values of β_1 and β_2 for z with $\bar{x}$ constant.

$n=$	5	10	25	50	100
$z_{\bar{z}}/\gamma$	·88623	·51583	·29811	·20519	·14322
$\sigma_{z_{\bar{z}}^2}/\gamma^2$	·214,6117	·019,6332	·002,0421	·000,4503	·000,1060
$z_{\bar{z}}\mu_3/\gamma^3$	·5058,5508	·0043,0858	·0000,7296	·0000,0503,947	·0000,0039,2428
$a_{\bar{z}}\mu_4/\gamma^4$	∞	·0021,8958	·0000,17702	·0000,0071,815	·0000,0003,658
$z_{\bar{z}}\beta_1$	25·8876	2·4530	·6251	·2781	·1292
$z_{\bar{z}}\beta_2$	∞	5·6804	4·2447	3·5240	3·2552
Mode/γ	·63246	·44721	·28284	·20000	·14142
$_{z}\beta_2$	∞	4·2000	3·3000	3·1333	3·0632

The mode is obtainable by aid of the formula: Mode $=\gamma\sqrt{2/n}$.

3. *Correlation, Regression and Scedasticity of z and σ.*

The frequency surface of z and σ is given by

$$w=w_0 e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}(1+z^2)}\sigma^{n-1}\quad[d\sigma\,dz] \qquad \text{.....(xx).}$$

Hence for σ constant the distribution of z is the normal curve

$$w=w_0' e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}z^2} \qquad \text{.....(xxi).}$$

From this it follows that the regression line of z on σ is horizontal or $\bar{z}_\sigma=0$ and the correlation coefficient $r_{z\sigma}=0$. But this does not signify that there is no correlation. The arrays of z for a given σ have varying standard deviation, or

$$\sigma_{z_\sigma}=\frac{\Sigma}{\sqrt{n}\sigma} \qquad \text{.....(xxii).}$$

* Their position and the sign of their skewness of course change.

Thus the scedastic curve is a rectangular hyperbola, and the scatter of z for a low value of σ is excessive. We can write Equation (xxii) in the form

$$\frac{\sigma_{z_\sigma}}{\sigma_z} = \sqrt{\frac{n-3}{n}}\,\frac{\Sigma}{\sigma} \quad \text{.....(xxii)}^{\text{bis}},$$

and we then have the following results.

Values of the Ratio $\sigma_{z_\sigma}/\sigma_z$.

	σ/Σ							
n	0·25	0·5	1·0	1·5	2·0	2·5	3·0	3·5
5	2·5298	1·2649	·6325−	·4216	·3162	·2530	·2108	·1807
10	3·3466	1·6733	·8367	·5578	·4183	·3347	·2789	·2390
25	3·7523	1·8762	·9381	·6254	·4690	·3752	·3127	·2680
50	3·8781	1·9391	·9695+	·6464	·4848	·3878	·3232	·2770
100	3·9395+	1·9698	·9849	·6566	·4924	·3940	·3283	·2814
500	3·9880	1·9940	·9970	·6647	·4985−	·3988	·3323	·2849
∞	4·0000	2·0000	1·0000	·6667	·5000	·4000	·3333	·2857

The fact that for a given σ, when σ is small, the variability of z can, owing to the hyperbolic form of the scedastic curve, so far exceed the total variability of z is discouraging at first sight for the use of z as a test. It signifies that for a low σ we may get a very great variation in the value of z, or the value of z in such cases can mean very little. It is important, however, before forming an opinion on this point to determine what is the frequency with which such values of σ occur for samples of different sizes. We therefore inquire in what percentage of cases σ will take a value such that σ_{z_σ} will be greater than σ_z.

The relative frequency with which values of σ less than σ_0 occur is given by

$$P = \frac{\displaystyle\int_0^{\sigma_0} e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}} \left(\frac{\sigma}{\Sigma}\right)^{n-2} d\sigma}{\displaystyle\int_0^{\infty} e^{-\frac{1}{2}\frac{n\sigma^2}{\Sigma^2}} \left(\frac{\sigma}{\Sigma}\right)^{n-2} d\sigma},$$

or writing $v = \frac{1}{2}\frac{n\sigma^2}{\Sigma^2}$ and $v_0 = \frac{1}{2}\frac{n\sigma_0^2}{\Sigma^2}$,

$$P = \frac{\displaystyle\int_0^{v_0} e^{-v} v^{\frac{1}{2}(n-3)}\, dv}{\Gamma\tfrac{1}{2}(n-1)} \quad \text{.....(xxiii).}$$

But in the notation of the *Tables of the Incomplete* Γ*-Function** this is

$$P = I(u_0, \tfrac{1}{2}(n-3)) \quad \text{.....(xxiv),}$$

* Published by H.M. Stationery Office, 1922.

where $$u_0 \times \sqrt{\tfrac{1}{2}(n-1)} = v_0 = \tfrac{1}{2}n\,\frac{\sigma_0^2}{\Sigma^2},$$

or $$u_0 = \frac{\tfrac{1}{2}n}{\sqrt{\tfrac{1}{2}(n-1)}}\,\frac{\sigma_0^2}{\Sigma^2} \qquad \text{.....(xxv).}$$

But by (xxii)^{bis} $$\frac{\sigma_{z_\sigma}}{\sigma_z} = \sqrt{\frac{n-3}{n}}\,\frac{\Sigma}{\sigma},$$

or if $\sigma_{z_\sigma} = \sigma_z$, then $\sigma_0/\Sigma = \sqrt{\dfrac{n-3}{n}}$, and it follows that

$$u_0 = \frac{\tfrac{1}{2}(n-3)}{\sqrt{\tfrac{1}{2}(n-1)}} \qquad \text{.....(xxvi).}$$

Thus the percentage occurrence of values of σ_{z_σ} greater than σ_z is given by

$$p_n = 100I\left(\frac{\tfrac{1}{2}(n-3)}{\sqrt{\tfrac{1}{2}(n-1)}},\ \tfrac{1}{2}(n-3)\right).$$

The values of p_n were found partly from Table III and partly from Table I of the above work with the following results.

Percentages of Cases in which σ_{z_σ} is greater than σ_z.

$n=$	5	10	15	25	50	100	$\to\infty$
p_n	26·42	36·29	39·37	41·99	44·54	46·19	$\to 50\,°/_{\circ}$

The disturbing feature of these percentages is that while for small samples the number of cases in which σ_{z_σ} exceeds σ_z is over a quarter, the proportional frequency increases as the size of the sample increases, until it becomes ultimately $50\,°/_{\circ}$. In other words the zero correlation coefficient of z and σ is sometimes accompanied by an increased instead of a reduced variability, when we fix one of the factors on which z depends, and this increased variability of z exists in a large percentage of the possible occurrences. I should therefore anticipate that the z test would tend to find probable extreme occurrences which by other tests were found to be improbable. The following table indicates the percentage total frequency of values of σ which fall below each recorded value of σ/Σ. It also provides the percentage total frequency of values of $\sigma_{z_\sigma}/\sigma_z$ which are above each recorded value of $\sigma_{z_\sigma}/\sigma_z$. It will be at once observed that the high values of the ratio σ/Σ have a very small frequency, but it is the low values of $\sigma_{z_\sigma}/\sigma_z$ which have these small frequencies. As the table is only intended to be indicative of the trends of the various relationships, values of σ/Σ were selected as near to ·25, ·50, 1·00, 1·50, 2·00, 2·50, 3·00 and 3·50 as possible, yet providing values of u, allowing easy interpolation from the *Tables of the Incomplete* Γ*-Function*. The corresponding values of u are also added.

The table indicates roughly the mechanism of the changes which occur in the distribution of the variability of z as the size of the sample increases.

As illustration of how this table is to be interpreted take the column headed $u = ·44$ for $n = 5$; the numbers signify that there will be $12·93\,°/_{\circ}$ of samples of five

Percentages of Occurrences of σ/Σ below the recorded Values and Percentages of Occurrences of $\sigma_{z_\sigma}/\sigma_z$ above the recorded Values.

$n=5$	u	·11	·44	1·8	4·0	7·1	11·0	15·9	21·7
	σ/Σ	·2494^5	·4989	1·0091	1·5042	2·0041	2·4945	2·9991	3·5036
	p_u	1·02 °/$_\circ$	12·93 °/$_\circ$	72·19 °/$_\circ$	97·67 °/$_\circ$	99·95 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$
	$\sigma_{z_\sigma}/\sigma_z$	2·5354	1·2677	·6267^5	·4205$^-$	·3156	·2535	·2182	·1805$^+$
$n=10$	u	·15	·59	2·4	5·3	9·4	14·7	21·2	28·9
	σ/Σ	·2523	·5003	1·0091	1·4995$^+$	1·9970	2·4973	2·9991	3·5016
	p_u	0·01 °/$_\circ$	1·92 °/$_\circ$	66·41 °/$_\circ$	99·25 °/$_\circ$	99·999 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$
	$\sigma_{z_\sigma}/\sigma_z$	3·3161	1·6723	·8291	·5579^5	·4190	·3350$^+$	·2790	·2389
$n=15$	u	·18	·71	2·85	6·4	11·3	17·7	25·5	34·7
	σ/Σ	·2520	·5005	1·0027	1·5026	1·9966	2·4988	2·9992	3·4987
	p_u	00·00 °/$_\circ$	00·32 °/$_\circ$	62·73 °/$_\circ$	99·78 °/$_\circ$	100 00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$
	$\sigma_{z_\sigma}/\sigma_z$	3·5493	1·7871	·8920	·5953	·4480	·3579	·2982	·2556
$n=25$	u	·23	·9	3·6	8·1	14·4	22·6	32·5	44·2
	σ/Σ	·2525	·4994	·9988	1·4982	1·9977	2·5026	3·0011	3·4999
	p_u	00·00 °/$_\circ$	00·01 °/$_\circ$	59·10 °/$_\circ$	99·98 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$
	$\sigma_{z_\sigma}/\sigma_z$	3·7156	1·8784	·9392	·6261	·4696	·3748	·3126	·2680
$n=50$	u	·32	1·25	5·1	11·4	20·2	31·6	45·5	61·9
	σ/Σ	·2517	·4975$^-$	1·0049	1·5024	1·9998	2·5013	3·0014	3·4980
	p_u	00·00 °/$_\circ$	00·00 °/$_\circ$	58·55 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$
	$\sigma_{z_\sigma}/\sigma_z$	3·8518	1·9489	·9648	·6453	·4848	·3876	·3230	·2772
$n=100$	u	·44	1·8	7·1	16·0	28·4	44·4	64·0	87·1
	σ/Σ	·2516	·5033	·9996	1·5005$^+$	1·9991	2·4996	3·0010	3·5010
	p_u	00·00 °/$_\circ$	00·00 °/$_\circ$	54·45$^+$ °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$	100·00 °/$_\circ$
	$\sigma_{z_\sigma}/\sigma_z$	3·9139	1·9569	·9853	·6564	·4927	·3940	·3282	·2813

wherein the standard deviation of the sample is less than ·4989 times (practically a half) the standard deviation of the parent population, but in these 12·93 °/$_\circ$ of cases the standard deviation of z will exceed 1·2677 times, say one and a quarter times, the standard deviation of the whole population of z's.

For small samples there are a considerable number of cases in which σ_{z_σ} is larger than σ_z, but few in which σ_{z_σ} is very restricted.

As the size of the sample increases the value of σ tends more and more to be restricted and to approach the parental value Σ. At the same time the value of the ratio $\sigma_{z_\sigma}/\sigma_z$ tends to unity, or the scatter of each array of z's tends to be as large as that of the whole population of z's. Taking into account what we have already noticed about the nature of the heteroscedasticity of z when we fix $\bar{x}$, we may, I think, reach the conclusion that the z test is not so efficient even for small samples as some have held. It may indeed suffice to show an improbability, but if it show nothing improbable, we must then bear in mind that it is not a very stringent test, and that other tests may indicate improbability where the z test indicates none.

THE WEST SCOTTISH SKULL AND ITS AFFINITIES.

By MATTHEW YOUNG, M.D., D.Sc.

A LARGE collection of modern Scottish skulls comprising over 700 specimens is preserved in the Museum of the Anatomy Department of the University of Glasgow. These skulls were taken from a graveyard in Glasgow about 30 years ago. Unfortunately, no definite information can be obtained as to the period of time to which the skulls actually belong, but it is probable that the majority may be referred to a date not later than the first half of the 19th century. The skulls were examined and measured in the year 1914 with the kind permission of Professor Bryce and a paper based on the results of the investigation, entitled, "A Contribution to the Study of the Scottish Skull," was published in the *Transactions of the Royal Society of Edinburgh* in 1916*. At the time this work was carried out it did not seem essential for the purpose in view to attempt to sex the whole of the skulls, and although a large series of measurements on all the skulls in the collection was made and published in tables in the paper referred to, the analysis in the text was based on samples of approximately 405 of the more typical males and 100 of the more typical females respectively. A group of the skulls, approximately 100 in number, in which the sex characters were less well defined, was left as of doubtful sex although it was recognised that the great majority of these were probably female.

Since the paper was published it has become more fully realised that the mean values of the measurements of the characters given therein could not be strictly regarded as truly representative of the two sex groups in the collection, more especially of the females, when such a relatively large number of the less determinate sex type was excluded from the averages. It was therefore thought advisable, where time and opportunity permitted, to resex the complete series and to recalculate the averages and variability of the cranial characters. Professor Bryce, at the request of the writer, very kindly consented to undertake the task of resexing the whole series including those that had previously been left as of doubtful sex. The number of skulls then available for analysis was 667, comprising 413 considered to be male and 254 considered to be female. The means and standard deviations of the measurements of the characters in these complete sex groups were recalculated. The constants for the group of male skulls were found to be practically identical with those already published. In the female group, which now included the great majority of the skulls previously left provisionally as of doubtful sex as well as a number exceeding fifty which had been considered to be female but had not been

* *Trans. Roy. Soc. Edin.* Vol. LI. Part II. No. 9, 1916.

used in the first analysis, the mean values of the absolute measurements of the characters showed in the majority of instances a slight increase. A comparison of the mean values and variabilities of the principal characters in the original sample of 100 female skulls and in the larger group of 254 skulls from the resexed series is shown in Table I. The mean increase in the glabella-occipital length (L), the basio-bregmatic height (H') and the zygomatic breadth (J) respectively is approximately 1·5 mm.; in the maximum parietal breadth (B), the minimum frontal breadth (B'),

TABLE I.

Showing Comparison of Means and Variability of Characters in the two series of Female Skulls.

Character	Original sample of 100 skulls		Resexed group of 254 skulls	
	Means	σ	Means	σ
Cranial capacity (C)	1314·50 ± 6·31	93·51 ± 4·46	1336·60 ± 4·37	103·35 ± 3·09
Cephalic index (100 B/L)	76·03 ± 0·19	2·89 ± 0·14	76·05 ± 0·12	2·84 ± 0·09
Height index (100 H'/L)	70·31 ± 0·20	3·00 ± 0·14	70·66 ± 0·12	2·76 ± 0·08
Breadth-height index (100 H'/B) ...	92·53 ± 0·30	4·42 ± 0·21	93·06 ± 0·17	4·10 ± 0·12
Nasal index (100 NB/NH') ...	46·77 ± 0·30	4·49 ± 0·21	46·71 ± 0·21	4·91 ± 0·15
Orbital index (rt) (100 O_2/O_1') ...	88·53 ± 0·35	5·21 ± 0·25	88·38 ± 0·22	5·10 ± 0·15
Palatal index (100 G_2/G_1)	77·27 ± 0·42	6·17 ± 0·29	76·39 ± 0·27	6·42 ± 0·19
Glabella-occipital length (L) ...	177·97 ± 0·32	4·75 ± 0·23	179·45 ± 0·22	5·26 ± 0·16
Maximum breadth (B)	135·16 ± 0·30	4·40 ± 0·21	136·29 ± 0·19	4·57 ± 0·14
Minimum frontal breadth (B') ...	92·66 ± 0·25	3·76 ± 0·18	93·62 ± 0·18	4·30 ± 0·13
Basio-bregmatic height (H') ...	125·01 ± 0·31	4·61 ± 0·22	126·63 ± 0·19	4·60 ± 0·14
Basi-alveolar length (GL)	88·61 ± 0·31	4·62 ± 0·22	89·82 ± 0·20	4·73 ± 0·14
Basi-nasal length (LB)	93·82 ± 0·21	3·11 ± 0·15	94·89 ± 0·16	3·68 ± 0·11
Nasi-alveolar length ($G'H$) ...	65·83 ± 0·25	3·67 ± 0·18	66·67 ± 0·16	3·88 ± 0·12
Interzygomatic breadth (J) ...	118·16 ± 0·27	3·94 ± 0·19	119·63 ± 0·17	3·93 ± 0·12
Intermalar breadth (GB)	85·09 ± 0·25	3·64 ± 0·17	85·80 ± 0·16	3·82 ± 0·11
Ophryo-occipital circumference (U)	503·61 ± 0·72	10·64 ± 0·51	507·14 ± 0·51	12·13 ± 0·36
Transverse arc (Q)	299·21 ± 0·61	9·04 ± 0·43	302·61 ± 0·41	9·63 ± 0·29
Sagittal arc (S)	363·15 ± 0·69	10·16 ± 0·48	366·43 ± 0·49	11·53 ± 0·34
Nasal height (NH')	48·41 ± 0·20	3·00 ± 0·14	49·07 ± 0·13	3·01 ± 0·09
Nasal width (NB)	22·56 ± 0·12	1·71 ± 0·08	22·63 ± 0·08	2·01 ± 0·06
Orbital height (O_2)	32·95 ± 0·14	2·07 ± 0·10	32·91 ± 0·08	1·96 ± 0·06
Orbital width (O_1')	37 24 ± 0·10	1·48 ± 0·07	37·29 ± 0·07	1·57 ± 0·05
Palatal length (G_1)	47·01 ± 0·20	2·96 ± 0·14	47·61 ± 0·13	3·12 ± 0·09
Palatal breadth (G_2)	36·21 ± 0·14	2·09 ± 0·10	36·15 ± 0·10	2·39 ± 0·07

the basi-alveolar length (GL), the nasi-alveolar height ($G'H$) and the basi-nasal length (LB) about 1 mm.; in the horizontal circumference (U), the transverse arc (Q) and the sagittal arc (S) from 3·0 to 3·5 mm.; in the intermalar breadth (GB), the nasal height (NH') and the palatal length (G_1) between 0·6 and 0·7 mm.; and in the cranial capacity (C) 22 c.c. over the corresponding measurements in the smaller sample. As the differences in the mean values of these corresponding measurements in the two groups exceed three times their probable errors they must be regarded

as probably significant. The means of the remaining absolute measurements given in the table for the two groups are not significantly different*.

The inclusion of the additional large group of female skulls has not changed materially the mean relative proportions of the skulls as shown by the indices. The cephalic index is identical in the two series and the slight differences shown in the remaining indices cannot be considered significant. Slight differences are shown in the variability of the several characters in the two groups, but in none is the change of such a degree that any significance should be attached to it.

The collection of skulls is so large and important that it seemed most desirable that tables of the mean values and variability of the principal characters for the separate sexes, which would be generally accepted as reliable and truly representative, should be made readily available for comparison with other series of skulls. The 700 skulls preserved at the University of Glasgow do not comprise the whole of the original collection, as approximately 300 skulls of the same series were not transferred to the University but were retained at St Mungo's Medical School, Glasgow, and are still preserved there in the Anatomical Museum. Through the kindness of Professor Battersby, access to this section of the collection and permission to examine and measure the skulls were obtained. These skulls were first sexed provisionally by the writer but were later also resexed by Professor Bryce. In this part of the collection, excluding juvenile skulls and certain skulls in which the facial portion had been detached, there were available for measurement 258 more or less complete adult skulls of which 137 were considered to be male and 121 female. The measurements on these skulls were made in accordance with the scheme devised by Professor Pearson and used in the Biometric School, and the methods of measurement described in the memoirs published in *Biometrika* were carefully followed with one or two exceptions, to which reference will be made later. This scheme of measurement had been generally but not closely followed in measuring the skulls at the University in 1914, and the majority of the skulls comprising this division of the collection were therefore remeasured to ensure that the figures would be comparable with the measurements taken on the series at St Mungo's College and to verify some of the previous measurements. Since the skulls at the University were measured in 1914, a number of specimens have unfortunately been removed from the collection. Combining the two sections of the original collection preserved in the two museums there were available for analysis 901 adult skulls, of which 524 were considered to be male and 377 female. The mean values and standard deviations for the series of

* The crania were extracted from a burial pit in which the bones were much huddled together. This may have been a clearance pit from the adjoining graveyard, or the bodies may have been hurriedly interred during an epidemic. Many of the skulls were in fragments and instructions were given to the foreman of the excavators to collect only those skulls which were practically complete. Thus there would be an unconscious selection of the stronger crania, i.e. the male as compared to the female, for the former would be the more likely to escape disintegration through the process of massed interment and the subsequent excavation by unskilled hands. These facts will probably suffice to account for the predominance of male crania and for the sex ratios, that is the ratios of male to female mean characters, being somewhat outstanding for the present series when we compare them with those of similar recent series from allied races.

characters measured are based on these numbers or on such smaller numbers as it was possible in certain instances to make the measurements. These are shown in Table II. As these values are based on all the adult skulls available, they may be accepted with some degree of confidence as being truly representative of the two sexes in this large collection of West Scottish skulls.

A brief reference may be made to the measurements which were not taken in strict accordance with the scheme devised and followed in the Biometric School.

1. *The Cranial Capacity.* The cubic capacity of the skulls at the University had been estimated in 1914 by filling with No. 8 lead shot. Although the desirability of re-estimating the capacity by the method of tight packing with mustard seed and weighing the content as described by Macdonell* was fully appreciated, sufficient time was not available to carry out this procedure in the 258 skulls at St Mungo's Medical School and the 700 skulls at the University. The capacities of the skulls at St Mungo's were therefore estimated with shot as the others had been and the mean values which are tabulated have been calculated from the cubic content estimated in this manner. It is probable, however, that the mean capacities for the two sexes do not deviate very appreciably from those that would have been found by the more accurate and scientific method, as, on using Miss Hooke's formulae† for estimating the cubic capacity (C) from the mean linear dimensions (1) L, B, and H' and (2) L, B, and OH, in London skulls, the results are as follows:

For the male, $C = \cdot 000366\, LBH' + 198{\cdot}87 \pm \frac{45{\cdot}8}{\sqrt{n}}$

gives $1472{\cdot}7 \pm 2{\cdot}0$ c.c.

and $C = \cdot 000416\, LB(OH) + 247{\cdot}86 \pm \frac{44{\cdot}3}{\sqrt{n}}$

gives $1465{\cdot}3 \pm 2{\cdot}0$ c.c.

in place of the tabulated value $1460{\cdot}5 \pm 3{\cdot}7$ c.c.

For the female, $C = \cdot 000366\, LBH' + 199{\cdot}43 \pm \frac{38{\cdot}9}{\sqrt{n}}$

gives $1332{\cdot}9 \pm 2{\cdot}0$ c.c.

and $C = \cdot 000422\, LB(OH) + 210{\cdot}83 \pm \frac{41{\cdot}8}{\sqrt{n}}$

gives $1315{\cdot}5 \pm 2{\cdot}2$ c.c.

in place of the tabulated value $1328{\cdot}6 \pm 3{\cdot}6$ c.c.

2. *Omission of some Characters.* Certain measurements, namely, the glabellar projective length (L'), the vertical height (H), and others relating to the nose and orbits, usually represented by the symbols DS, DC, DA, SS, SC and IOW, have been omitted.

3. *Cranial Contours.* The importance of tracing outlines of random samples of 100 skulls from the male and female groups respectively in the three standard planes

* *Biometrika*, Vol. III. 1904, pp. 203—206.

† *Biometrika*, Vol. XVIII. 1926, pp. 33 and 34.

TABLE II.

Showing Mean Values and Variability of Characters.*

Character	Males				Females			
	No.	Means	σ	v	No.	Means	σ	v
C	506	1460·47 ± 3·71	123·80 ± 2·63	8·48 ± 0·18	364	1328·57 ± 3·59	101·50 ± 2·54	7·64 ± 0·19
F	524	186·12 ± 0·18	6·01 ± 0·13	3·23 ± 0·07	374	179·47 ± 0·18	5·28 ± 0·13	2·94 ± 0·07
L	524	188·18 ± 0·18	6·13 ± 0·13	3·26 ± 0·07	374	179·86 ± 0·18	5·19 ± 0·13	2·89 ± 0·07
B	524	139·15 ± 0·14	4·81 ± 0·10	3·46 ± 0·07	374	135·62 ± 0·15	4·40 ± 0·11	3·24 ± 0·08
B'	425	96·64 ± 0·15	4·42 ± 0·10	4·57 ± 0·11	374	93·38 ± 0·15	4·16 ± 0·10	4·45 ± 0·11
H'	521	132·91 ± 0·16	5·52 ± 0·12	4·15 ± 0·09	372	126·96 ± 0·16	4·63 ± 0·11	3·65 ± 0·09
OH	522	111·76 ± 0·13	4·45 ± 0·09	3·98 ± 0·08	373	107·31 ± 0·13	3·80 ± 0·09	3·54 ± 0·09
LB	516	100·79 ± 0·12	4·20 ± 0·09	4·17 ± 0·09	370	94·99 ± 0·13	3·81 ± 0·09	4·01 ± 0·10
Q	420	306·43 ± 0·35	10·68 ± 0·25	3·49 ± 0·08	368	296·62 ± 0·32	9·16 ± 0·23	3·09 ± 0·08
Q'	420	309·64 ± 0·36	10·94 ± 0·25	3·53 ± 0·08	368	300·19 ± 0·33	9·39 ± 0·23	3·13 ± 0·08
S	522	378·51 ± 0·38	13·02 ± 0·27	3·44 ± 0·07	376	365·67 ± 0·41	11·73 ± 0·29	3·21 ± 0·08
S_1	522	130·93 ± 0·19	6·34 ± 0·13	4·84 ± 0·10	377	127·02 ± 0·21	5·95 ± 0·15	4·68 ± 0·11
S_2	522	127·36 ± 0·23	7·79 ± 0·16	6·12 ± 0·13	377	122·51 ± 0·24	6·91 ± 0·17	5·64 ± 0·14
S_3	522	120·00 ± 0·22	7·42 ± 0·15	6·18 ± 0·13	376	115·88 ± 0·24	6·91 ± 0·17	5·96 ± 0·15
S_1'	522	113·18 ± 0·14	4·85 ± 0·10	4·29 ± 0·09	377	109·37 ± 0·16	4·47 ± 0·11	4·09 ± 0·10
S_2'	522	114·66 ± 0·18	5·97 ± 0·12	5·21 ± 0·11	377	110·36 ± 0·19	5·42 ± 0·13	4·91 ± 0·12
S_3'	522	98·17 ± 0·16	5·31 ± 0·11	5·41 ± 0·11	376	94·84 ± 0·16	4·73 ± 0·12	4·99 ± 0·12
U	497	523·83 ± 0·43	14·25 ± 0·30	2·72 ± 0·06	370	506·65 ± 0·44	12·51 ± 0·31	2·47 ± 0·06
PH	340	20·84 ± 0·11	2·91 ± 0·08	13·96 ± 0·36	255	19·94 ± 0·11	2·55 ± 0·08	12·79 ± 0·38
G'H	423	72·17 ± 0·15	4·53 ± 0·11	6·28 ± 0·15	279	68·15 ± 0·16	4·07 ± 0·12	5·97 ± 0·17
GB	500	90·50 ± 0·15	4·89 ± 0·10	5·40 ± 0·12	346	85·82 ± 0·14	3·94 ± 0·10	4·59 ± 0·12
J	466	127·94 ± 0·17	5·37 ± 0·12	4·20 ± 0·09	327	120·26 ± 0·15	4·07 ± 0·11	3·38 ± 0·09
NH'	372	50·19 ± 0·12	3·39 ± 0·08	6·75 ± 0·17	230	47·83 ± 0·14	3·06 ± 0·10	6·40 ± 0·20
NH, R	519	50·95 ± 0·10	3·25 ± 0·07	6·38 ± 0·13	370	48·67 ± 0·10	2·74 ± 0·07	5·63 ± 0·14
NH, L	514	50·86 ± 0·10	3·20 ± 0·07	6·29 ± 0·13	369	48·70 ± 0·10	2·73 ± 0·07	5·61 ± 0·14
NB	523	23·31 ± 0·05	1·78 ± 0·04	7·64 ± 0·16	372	22·47 ± 0·07	1·89 ± 0·05	8·41 ± 0·21
O_1R	501	41·37 ± 0·05	1·71 ± 0·04	4·13 ± 0·09	354	39·75 ± 0·06	1·60 ± 0·04	4·03 ± 0·10
O_1L	494	41·39 ± 0·05	1·70 ± 0·04	4·11 ± 0·09	353	39·82 ± 0·06	1·62 ± 0·04	4·07 ± 0·10
O_2R	500	33·55 ± 0·06	2·09 ± 0·04	6·23 ± 0·13	354	33·28 ± 0·07	1·93 ± 0·05	5·80 ± 0·15
O_2L	494	33·64 ± 0·06	2·07 ± 0·04	6·15 ± 0·13	353	33·42 ± 0·07	1·95 ± 0·05	5·83 ± 0·15
O_1'	472	39·64 ± 0·05	1·70 ± 0·04	4·29 ± 0·09	337	37·98 ± 0·06	1·56 ± 0·04	4·11 ± 0·11
G_1	239	49·55 ± 0·15	3·49 ± 0·11	7·04 ± 0·22	219	46·62 ± 0·15	3·22 ± 0·10	6·91 ± 0·22
G_1'	237	45·61 ± 0·14	3·17 ± 0·10	6·95 ± 0·22	219	42·91 ± 0·13	2·92 ± 0·09	6·80 ± 0·22
G_2	239	37·80 ± 0·13	2·99 ± 0·09	7·91 ± 0·24	219	36·27 ± 0·12	2·72 ± 0·09	7·50 ± 0·24
GL	423	94·30 ± 0·17	5·16 ± 0·12	5·47 ± 0·13	279	89·50 ± 0·20	4·92 ± 0·14	5·50 ± 0·16
fml	421	35·75 ± 0·08	2·43 ± 0·06	6·80 ± 0·16	368	34·41 ± 0·08	2·15 ± 0·05	6·25 ± 0·16
fmb	421	30·15 ± 0·07	2·23 ± 0·05	7·40 ± 0·17	368	28·89 ± 0·07	2·03 ± 0·05	7·03 ± 0·17
100 *B/L*	524	74·00 ± 0·08	2·62 ± 0·05	3·54 ± 0·07	374	75·49 ± 0·10	2·81 ± 0·07	3·72 ± 0·09
100 *B/F*	524	74·79 ± 0·08	2·58 ± 0·05	3·45 ± 0·07	374	75·64 ± 0·10	2·76 ± 0·07	3·65 ± 0·09
100 *H'/L*	521	70·68 ± 0·09	3·00 ± 0·06	4·24 ± 0·09	370	70·61 ± 0·10	2·90 ± 0·07	4·11 ± 0·10
100 *B/H'*	521	104·88 ± 0·14	4·84 ± 0·10	4·61 ± 0·10	372	107·04 ± 0·17	4·74 ± 0·12	4·43 ± 0·11
100 *G'H/GB*	329	79·92 ± 0·21	5·67 ± 0·15	7·09 ± 0·19	270	79·77 ± 0·21	5·13 ± 0·15	6·43 ± 0·19
100 *NB/NH, R*	421	46·14 ± 0·14	4·17 ± 0·10	9·04 ± 0·21	370	46·21 ± 0·15	4·17 ± 0·10	9·02 ± 0·22
100 *NB/NH, L*	421	46·15 ± 0·14	4·17 ± 0·10	9·04 ± 0·21	370	46·16 ± 0·15	4·26 ± 0·11	9·23 ± 0·23
100 *NB/NH'*	372	46·85 ± 0·16	4·61 ± 0·11	9·84 ± 0·24	230	47·06 ± 0·22	4·84 ± 0·15	10·28 ± 0·32
100 O_2/O_1R	500	81·33 ± 0·15	5·06 ± 0·11	6·22 ± 0·13	354	83·95 ± 0·17	4·73 ± 0·12	5·63 ± 0·14
100 O_2/O_1L	494	81·49 ± 0·15	4·94 ± 0·11	6·06 ± 0·13	353	84·14 ± 0·17	4·86 ± 0·12	5·78 ± 0·15
100 $O_2/O_1'R$	466	84·83 ± 0·16	5·27 ± 0·12	6·21 ± 0·14	331	87·71 ± 0·17	4·69 ± 0·12	5·35 ± 0·14
100 *fmb/fml*	421	84·53 ± 0·17	5·28 ± 0·13	6·25 ± 0·15	368	84·08 ± 0·17	4·90 ± 0·12	5·83 ± 0·14
100 G_2/G_1	239	76·70 ± 0·32	7·41 ± 0·23	9·66 ± 0·30	218	78·13 ± 0·32	6·90 ± 0·22	8·83 ± 0·29
∠ *P*	332	86·63 ± 0·11	3·10 ± 0·08	3·58 ± 0·09	267	86·47 ± 0·12	2·86 ± 0·08	3·31 ± 0·10
∠ *N*	423	63·45 ± 0·12	3·64 ± 0·08	5·74 ± 0·13	280	63·73 ± 0·14	3·35 ± 0·10	5·26 ± 0·15
∠ *A*	423	73·37 ± 0·11	3·22 ± 0·07	4·39 ± 0·10	280	72·98 ± 0·13	3·21 ± 0·09	4·40 ± 0·13
∠ *B*	423	43·25 ± 0·10	2·94 ± 0·07	6·80 ± 0·16	280	43·41 ± 0·11	2·74 ± 0·08	6·31 ± 0·18
∠ θ_1	332	29·69 ± 0·11	2·96 ± 0·08	9·97 ± 0·26	267	29·87 ± 0·11	2·66 ± 0·08	8·91 ± 0·26
∠ θ_2	332	13·42 ± 0·12	3·16 ± 0·08	23·55 ± 0·62	267	13·47 ± 0·12	2·97 ± 0·09	22·05 ± 0·64
Oc. I.	521	59·15 ± 0·09	3·14 ± 0·07	5·31 ± 0·11	372	58·89 ± 0·08	2·24 ± 0·06	3·80 ± 0·09

* See note, p. 22.

for the purpose of constructing mean cranial contours was recognised, but time for the procedure to be carried out was not available.

It may be stated here that in measuring the orbital width the nasal margin of the orbit was determined by Fawcett's circular method*, and that the auricular height having been determined by Ranke's craniophor with the flat-topped ear-plugs, the readings were adjusted by deducting 2·5 mm. to allow for the scale record which is graduated to read with the rounded conical plugs†.

Reference to Table II shows that the variability for skull length in the male is 6·1 mm. and for skull breadth 4·8 mm. As these values lie between 6·5 and 5·5 and 6·5 and 3·3 respectively, the conclusion may be drawn in accordance with Professor Pearson's criterion‡ that the group of male skulls is neither heterogeneous nor a rather stringently selected sample. In the female group the standard deviation for skull length is 5·2 mm. and for skull breadth 4·4 mm., which seem to indicate that the female sample may also be considered homogeneous and not stringently selected.

It is well known that the accurate sexing of a certain proportion of any long series of skulls presents some difficulty as the sexual characters are not always well defined. The sexual dimensional differences in the Scottish group seem to be in fairly close agreement with those shown in some other long series of skulls, namely, the 17th century Londoners from Whitechapel and Farringdon Street. This concordance is illustrated in regard to several of the principal measurements in Table III.

TABLE III.

Showing the Differences in mm. between the Male and Female Mean Values for certain Characters in the West Scottish Series in comparison with those shown in the 17th Century Londoners.

Character	West Scottish series	Whitechapel series	Farringdon Street series
L	8·3	8·7	7·2
F	6·6	7·3	6·1
B	3·5	6·0	6·7
B'	3·3	4·9	3·5
H'	5·9	7·4	7·2
OH	4·5	5·4	4·8
U	17·2	20·5	22·2
S	12·8	14·3	16·5

* *Biometrika*, Vol. I. p. 430; Vol. VIII. pp. 311 and 312.

† [The statement made by Miss Tildesley (*Biometrika*, Vol. XIII. p. 217) is too sweeping. There is no error of the instrument maker in the graduation. She was using the knife-edged plugs and not the conical plugs. If the scriber be used, *as it should be*, first set to the true auricular point and then read off on the craniophor scale, there is no need whatever for a delicate adjustment of the skull on the ear plugs, which may be thrust right into the auricular passages for safety. The difference of the bar reading and of the scriber reading gives the true auricular height.—ED.]

‡ "Craniological Notes." *Biometrika*, Vol. II. 1903.

Having determined the means and variability of the principal characters of the relatively long West Scottish series, it seemed to be of interest to compare the group with certain other groups of British skulls for which similar measurements were available by means of the coefficient of racial likeness, a method of comparison of racial types which was devised a few years ago by Professor Pearson*. The series of skulls selected for comparison with the West Scottish group were the Lowland Scottish†, the British Iron Age, the British Neolithic, the Anglo-Saxon and the Whitechapel and Farringdon Street collections of 17th century Londoners. The comparable data for these groups have all been obtained from the memoirs in *Biometrika*‡.

The coefficients of racial likeness were calculated, using the mean values of the 31 characters, 12 indices and angles and 19 absolute measurements, selected and used by Morant as being most suitable for the purpose, or as many of these characters as were available for the different series, excluding all means based on less than 5 skulls. In calculating the values of α for the several characters the standard deviations used were those derived from the longest series of skulls available, namely, the Egyptian series of the XXVI—XXX dynasties§, as these have been used in many of the comparisons that have been made in the memoirs in *Biometrika*, and it seemed desirable to adhere closely to the methods described there for the sake of uniformity.

The coefficients of racial likeness between the West Scottish series of males and females and the several groups with which they have been compared are shown in Tables IV and V, and the values of $\alpha = \frac{n_s n_{s'}}{n_s + n_{s'}} \left(\frac{M_s - M_{s'}}{\sigma_3} \right)^2$ for the different characters in the Scottish and the other series of skulls in the two sexes are shown in Table VI.

Coefficients of Racial Likeness.

In the male groups, the mean number of skulls available for measurement of the characters used in calculating the coefficients of racial likeness varies from 30 to 90, but the numbers are approximately equal in the respective pairs of series Lowland Scottish and British Iron Age, Anglo-Saxon and British Neolithic and Whitechapel and Farringdon Street 17th century Londoners. It is thus possible to compare directly the relative degree of association of the West Scottish group with the members of each of these series of pairs. The coefficients for all characters seem to indicate that the West Scottish type is more closely related to the British Iron Age type than to the Lowland Scottish type, the coefficient in the former case is just under 4, representing a relationship that is described in Professor Pearson's classification‖ as "close" association, whereas in the Lowland Scottish group the coefficient almost reaches 5, representing a "moderate" degree of association. To the

* *Biometrika*, Vol. XVI. 1924, pp. 11—14; Vol. XVIII. 1926, p. 135.

† This group was obtained by Dr Morant by pooling the Scottish skulls described by Sir W. Turner that were mainly derived from the region to the south of the River Forth.

‡ *Biometrika*, Vol. XVIII. 1926, pp. 82 and 84.

§ *Biometrika*, Vol. XVI. 1923—24, p. 328.

‖ *Biometrika*, Vol. XVIII. 1926, p. 105.

Anglo-Saxon and the Neolithic type, the West Scottish series seems to show an approximately similar degree of relationship, the degree of association in the classificatory scale already referred to being "slight." The West Scottish series appears to be distinctly more closely related to the 17th century Londoners from Whitechapel than to those from Farringdon Street. The coefficient in the former case is 8·1 which, falling between 7 and 10, represents a "slight" degree of association, whereas the coefficient between the Scottish type and the Farringdon Street group is 14·5, indicating a slight degree of divergence. The C. R. L's for indices and angles or shape

TABLE IV.

Male Coefficients of Racial Likeness.*

	West Scottish (447·8)			
	Crude Coefficients		Reduced Coefficients ($\bar{n}_1=\bar{n}_2=100$)	
	All Characters	Indices and Angles	All Characters	Indices and Angles
Lowland Scottish (48·2)	4·72 ± ·20 {23}	5·54 ± ·36 {7}	5·42 ± ·23	6·36 ± ·41
British Iron Age (52·7)	3·74 ± ·20 {23}	3·85 ± ·36 {7}	3·96 ± ·21	4·08 ± ·38
Anglo-Saxon ... (33·4)	9·29 ± ·17 {31}	5·29 ± ·28 {12}	14·95 ± ·27	8·51 ± ·45
British Neolithic (30·5)	9·54 ± ·18 {27}	6·55 ± ·32 {9}	16·70 ± ·32	11·47 ± ·56
Whitechapel ... (91·7)	8·12 ± ·17 {30}	9·68 ± ·29 {11}	5·33 ± ·11	6·36 ± ·19
Farringdon Street (93·7)	14·52 ± ·17 {31}	20·12 ± ·28 {12}	9·37 ± ·11	12·98 ± ·18

TABLE V.

Female Coefficients of Racial Likeness.*

	West Scottish (337·7)			
	Crude Coefficients		Reduced Coefficients ($\bar{n}_1=\bar{n}_2=100$)	
	All Characters	Indices and Angles	All Characters	Indices and Angles
Lowland Scottish (24·0)	2·74 ± ·20 {23}	4·58 ± ·36 {7}	6·11 ± ·45	10·22 ± ·80
British Iron Age (27·1)	3·95 ± ·22 {19}	3·35 ± ·39 {6}	7·87 ± ·44	6·68 ± ·78
Anglo-Saxon ... (29·4)	12·87 ± ·17 {31}	16·29 ± ·28 {12}	23·79 ± ·31	30·11 ± ·52
British Neolithic (16·6)	16·35 ± ·25 {14}	11·53 ± ·55 {3}	51·67 ± ·79	36·44 ± 1·74
Whitechapel ... (88·7)	6·32 ± ·18 {27}	6·41 ± ·30 {10}	4·50 ± ·13	4·56 ± ·21
Farringdon Street (110·2)	13·91 ± ·17 {31}	22·48 ± ·28 {12}	8·37 ± ·10	13·53 ± ·17

* The numbers in round brackets are the mean numbers of skulls available for each type for the characters used in computing the C.R.L.'s. The numbers in curled brackets following the coefficients are the numbers of characters on which each coefficient is based.

characters alone indicate that the West Scottish type resembles more closely in form the Iron Age type than the Lowland Scottish type, the respective degrees of association being "close" and "moderate." The Anglo-Saxon and the British Neolithic both have a "moderate" degree of association with the West Scottish, the Whitechapel Londoners are "slightly" associated with it, whereas the 17th century Londoners from Farringdon Street show a "moderate" degree of divergence from this type. Though the series of coefficients for the several groups just referred to are not all directly comparable as they are influenced by the varying size of the samples in the series, they may be made comparable by reducing them to a standard value of 100 skulls in the manner described by Professor Pearson*.

By this means it is possible to see at a glance the relative degree of divergence of the several series from the West Scottish. The C. R. L.'s, adjusted to correct for the varying number of male skulls in the groups, are also shown in Table IV. They indicate that, of the six groups which are compared with the West Scottish, the British Iron Age type diverges least from it, while the Lowland Scottish and Whitechapel Londoners are slightly more divergent from it but diverge to an equal degree. The divergence of the remaining types from the West Scottish increases in the following sequence: Farringdon Street 17th century Londoners, Anglo-Saxon and British Neolithic. With respect to skull shape, however, as shown by the adjusted coefficients for indices and angles, the Anglo-Saxon and Neolithic seem to be relatively less divergent from the West Scottish type than the Farringdon Street 17th century Londoners.

The coefficients of racial likeness for the females shown in Table V indicate that the British Iron Age type and the Lowland Scottish type are "closely" associated, the Whitechapel 17th century Londoners "moderately" associated and the Anglo-Saxons "doubtfully" associated with the West Scottish type, whereas the Farringdon Street 17th century Londoners and the British Neolithic are to a slight degree divergent from it. The coefficients adjusted to make allowance for the varying number of skulls in the several groups (Table V) suggest that the Whitechapel 17th century Londoners are relatively least divergent from the West Scottish type and that the divergence increases progressively in the groups Lowland Scottish, British Iron Age, Farringdon Street Londoners, Anglo-Saxon and British Neolithic. In regard to shape characters alone the same sequence of relative divergence holds, except that the British Iron Age type shows less deviation than the Lowland Scottish from the West Scottish type.

Comparison of Mean Measurements.

The values of $\alpha = \frac{n_s n_s'}{n_s + n_s'} \left(\frac{M_s - M_s'}{\sigma_s} \right)^2$ between the series of pairs of corresponding characters which were used in computing the C. R. L.'s between the West Scottish and the several racial types are shown in Table VI. From the magnitude of these values it can be readily seen in which characters the two racial types compared are most alike and in which they differ most significantly. As is customary, if α is

* *Biometrika*, Vol. xx B., p. 376, 1928.

between 0 and 2·7 the conclusion may be drawn that the characters have a common origin, if between 2·7 and 6·1 they are regarded as exhibiting differences which are probably significant, if above 6·1 the probability of their representing samples from the same population is exceedingly small.

Turning to the table, it is seen that in comparing the males in the West Scottish and Lowland Scottish groups, out of the 23 characters available there are seven in

TABLE VI.

Values of $\alpha = \frac{n_s n_{s'}}{n_s + n_{s'}} \left(\frac{M_s - M_{s'}}{\sigma_s}\right)^2$ *between the West Scottish and the other British Crania.*

Character	Lowland Scottish		British Iron Age		British Neolithic		Anglo-Saxon		Whitechapel		Farringdon Street	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
100 *B/L*	11·52	8·95	14·89	0·28	35·43	4·31	3·22	8·30	1·31	9·45	28·73	8·58
100 *H'/L*	0·22	0·28	0·25	0·10	1·35	8·76	0·69	2·51	5·53	24·59	48·03	97·97
100 *B/H'*	5·76	3·89	7·13	1·12	7·43	24·53	0·00	3·84	15·42	6·78	124·16	86·86
100 *G'H/GB*	—	—	—	—	13·56	—	32·68	105·17	21·42	8·09	17·55	36·99
100 *NB/NH, R*	—	—	—	—	0·25	—	4·99	30·74	9·27	9·81	9·10	35·19
100 *NB/NH'*	15·52	14·13	0·04	7·04	—	—	—	—	—	—	—	—
100 $O_2/O_1 R$	—	—	—	—	—	—	8·29	19·87	30·43	5·64	0·24	0·12
100 $O_2/O_1' R$	10·66	2·39	0·39	—	6·93	—	—	—	—	—	—	—
100 *fmb/fml*	—	—	—	—	0·13	—	2·49	3·13	0·00	—	3·06	0·00
100 G_2/G_1	—	—	—	—	—	—	8·37	1·05	17·21*	0·15	3·68	2·34
Oc. I.	—	—	—	—	—	—	3·01	1·84	—	—	13·87	0·48
∠ *P*	—	—	—	—	—	—	3·27	14·44	1·26	1·79	2·54	4·37
∠ *N*	2·04	6·07	11·26	17·32	0·69	—	2·76	16·43	15·67	4·46	2·47	3·76
∠ *A*	0·03	3·32	0·02	0·23	2·18	—	5·68	0·19	0·00	3·30	0·05	5·15
C	3·33	0·22	3·16	0·04	9·76	94·64	15·52	5·27	1·31	6·38	2·52	11·80
L	0·54	0·11	1·07	0·04	44·54	7·12	9·21	9·50	2·68	1·14	1·21	15·87
B	18·16	8·61	18·22	0·94	0·41	0·02	23·73	0·00	10·65	4·03	50·17	0·06
B'	0·46	1·16	4·87	11·96	10·07	0·48	1·55	2·82	12·06	0·66	0·27	0·09
OH	—	—	—	—	15·62	—	9·33	13·91	0·57	2·78	12·67	19·25
H'	0·91	0·12	0·00	0·49	—	34·07	—	—	—	—	—	—
LB	3·47	0·07	1·95	1·23	8·01	4·88	20·19	11·30	3·95	0·66	2·97	5·60
Q	0·05	0·81	0·80	—	2·49	—	9·41	0·56	2·14	8·14	0·24	36·55
S	0·19	1·43	0·15	1·21	20·60	10·76	0·62	0·20	1·31	7·36	0·06	12·14
U	6·22	1·14	6·81	3·48	75·57	38·18	22·53	6·31	0·13	5·63	20·36	1·19
G'H	1·02	0·05	15·63	24·23	3·38	—	0·30	9·27	14·80	17·36	11·55	23·55
J	24·45	5·20	17·18	14·27	11·27	12·25	44·27	35·26	9·11	0·00	18·10	0·02
NH, R	—	—	—	—	0·15	2·36	4·18	0·36	0·73	0·00	7·00	3·62
NH'	19·21	25·21	1·47	0·04	—	—	—	—	—	—	—	—
NB	0·52	0·73	3·03	9·69	0·92	0·55	12·22	24·25	19·71	9·96	38·59	24·50
$O_1 R$	—	—	—	—	—	—	14·76	32·04	55·75	36·61	20·25	9·17
$O' R$	1·41	0·37	0·65	—	0·30	—	—	—	—	—	—	—
$O_2 R$	5·87	0·60	0·00	0·32	7·03	—	0·00	1·86	0·67	2·55	9·54	3·01
G_1	—	—	—	—	—	—	0·60	29·63	6·94	11·63	0·19	0·23
G_2	—	—	—	—	5·67	—	42·98	35·39	13·20†	8·68	14·09	8·85
fml	0·07	1·26	0·00	—	0·67	—	9·04	4·55	0·15	—	14·82	3·69
fmb	—	—	—	—	0·06	—	3·03	0·00	0·20	—	2·93	1·08

* $\alpha = 0{\cdot}17$ } using Macdonell's means; the values tabulated are derived from the means calculated
† $\alpha = 7{\cdot}47$ } by Morant for smaller numbers in which the points of measurement were intact or well defined.

which α exceeds 6·1. These are $B, J, NH', U, 100\,B/L, 100\,O_2/O_1'R$ and $100\,NB/NH'$. The mean maximum cranial breadth is smaller in the West Scottish than in the Lowland Scottish type, but the maximum lengths and basi-bregmatic heights do not differ appreciably; the face is less broad, the orbital and the nasal indices are lower in the West Scottish type. The difference in the last measurement may, however, be partly accounted for by difference in technique of measurement, as the base of the anterior nasal spine is not always a well-defined point. In comparing the females in the same two groups there are four characters in which α exceeds 6·1. These are B, NH', $100\,B/L$ and $100\,NB/NH'$. As in the males, the maximum biparietal diameter is distinctly less in the West Scottish than in the Lowland Scottish and the maximum cranial lengths and basi-bregmatic heights again correspond closely in the two groups. The face in the West Scottish female is narrower than in the Lowland Scottish type to a degree which is probably significant. The nasal index appears to be, as in the male, definitely lower in the former group.

On comparing the males of the West Scottish and Iron Age types, there are again, out of 23 characters available, seven in which α exceeds 6·1. As in the comparison with the Lowland Scottish male, three of the most outstanding differences occur in B, J, and $100\,B/L$. The cranium is narrower in the West Scottish type, but the basi-bregmatic heights coincide and the maximum lengths are not significantly different; the face is also sensibly narrower in the West Scottish type than in the Iron Age type. The West Scottish female type differs from the Iron Age female type chiefly in the facial region; the calvarial lengths, breadths and heights do not differ significantly in the two groups. In the West Scottish type, however, the forehead is definitely narrower, the face narrower and longer, the nasal aperture narrower and the nasial angle (N) smaller.

The West Scottish males differ from the Neolithic males principally in their less extensive cranial length and cranial height, the maximum breadths are in fairly close agreement. α is greater than 6·1 in 13 out of the 27 characters compared in the two types. Amongst these, in addition to cranial length and height already referred to, are $100\,B/L$, B', LB, U, S, C and J. The Scottish type has a narrower forehead, a shorter basi-nasal length, a smaller sagittal arc and horizontal circumference, and a smaller cubic capacity. The face and palate are also narrower and the orbit higher in the Scottish male.

For comparison of the West Scottish female with the Neolithic only 14 characters are available after exclusion of those averages which are based on fewer than 5 skulls in the latter group. The averages used are in a number of instances derived from skulls less than 10 in number. Not too much emphasis should thus be laid on what appear to be notable differences in the females of the two types, although their probable reality is supported by the fact that the important differences coincide largely with those found in the comparison of the males. In the West Scottish female the cranial vault seems to be shorter and distinctly lower than in the Neolithic, but the maximum breadth corresponds closely in the two types. The West Scottish

female also shows a smaller cubic capacity, a shorter sagittal arc and horizontal circumference and a narrower face than the Neolithic.

On comparing the West Scottish and Anglo-Saxon male groups, practically half the characters used show values of α exceeding 6·1, and 23 out of the 31 selected exceed 2·7. The outstanding difference in the two types is the smaller general average size of the West Scottish. This is shown by a significantly smaller calvarial length, breadth and height, a smaller basi-nasal length, transverse arc, horizontal circumference and cubic capacity. There are also notable differences in the face and palate in the two groups. The West Scottish face is decidedly narrower in both facial measurements, J and GB, and the orbital and nasal apertures and palate are also significantly less in width than in the Anglo-Saxon.

In the West Scottish and Anglo-Saxon female groups, the mean maximum cranial breadths are identical, but the differences found in the females of the two types correspond generally with those found in the males. Thus the West Scottish female has a shorter and lower calvarium than the Anglo-Saxon female. It shows also a shorter basi-nasal length, a less extensive horizontal circumference and a cubic capacity which is smaller to a degree that is probably significant. In the West Scottish female the face is distinctly narrower and longer, the orbital and nasal apertures narrower on the average, the palate shorter and narrower and the nasial angle smaller than in the female Anglo-Saxon.

The most striking differences in the calvaria of the males of the West Scottish series and the 17th century Londoners from Whitechapel are the less extensive maximum and frontal breadths in the former type. The maximum cranial lengths and auricular heights do not differ significantly in the two groups. There are also significant differences in the facial region of the skull. The West Scottish type has a narrower and a longer face, narrower orbital and nasal apertures and a relatively narrower palate. The nasial angle (N) is also significantly smaller. On comparing the females in the same two groups, α exceeds 6·1 in 13 of the 27 characters used. The maximum cranial breadth in the West Scottish exceeds that in the Londoners to a degree which is probably significant; the auricular height is also greater, but the difference can hardly be considered significant; the basi-bregmatic height, the transverse and sagittal arcs are definitely greater than in the Londoners, but the maximum cranial lengths do not differ sensibly. The values of α for $100B/L$, $100H'/L$, $100B/H'$ and C all exceed 6·1. As in the male, the West Scottish female has a longer face and narrower orbital and nasal apertures. The palate is longer and wider in the Scottish though the palatal index corresponds closely in the two types.

From the 17th century male Londoners found in Farringdon Street, the West Scottish type is chiefly distinguished by a narrower and higher calvarium; the skull length is not significantly different in the two types. Significant differences are also observed in the facial portion of the skull. As has been shown in comparison with the Whitechapel group, the West Scottish skull is longer and narrower in this region and the nasal and orbital apertures and palate are also narrower. The nasal height and the nasal index are smaller and the orbital height is less in the West Scottish than in the Farringdon Street group.

The West Scottish female has a definitely shorter and higher skull on the average than the females from Farringdon Street though the maximum cranial and frontal breadths correspond closely in the two types. $100H'/L$ and $100B/H'$ thus show high values of α (between 80 and 100) and $100B/L$ a value exceeding 6·1. The cubic capacity and the transverse and sagittal arcs are decidedly greater in the Scottish type than in the Londoners. In the facial region the females of the two types show a somewhat similar divergence to that observed in the males. The West Scottish type has a definitely longer face and narrower nasal and orbital apertures and palate than the Farringdon Street type.

Conclusions.

1. The West Scottish male skull resembles the British Iron Age type more closely than any of the other British types with which it has been compared, including Morant's Lowland Scottish group.

2. The relative degree of divergence between the West Scottish and the 17th century Londoners from Whitechapel is identical with that shown between the West Scottish and the Lowland Scottish types.

3. The 17th century Londoners from Farringdon Street are distinctly less closely related to the West Scottish than are the Londoners of the same period from Whitechapel.

4. The relative degree of divergence of the West Scottish from the Anglo-Saxon and the Neolithic types is notably greater than that from the Farringdon Street Londoners.

5. In the female groups the order of relative divergence from the West Scottish does not accord exactly with that shown in the males. The Whitechapel females resemble the West Scottish most closely and the Lowland Scottish and Iron Age types are rather more divergent from it; the remaining groups follow the sequence shown in the male.

6. The close affinity between the modern West Scottish type, as illustrated by the collection in Glasgow, and the British Iron Age type, as described by Morant, lends support, so far as regards this group at least, to Morant's conclusion that the modern population of the greater part of Scotland is directly descended from the Iron Age type which has not been essentially modified since its first appearance.

7. The relatively close relationship shown to exist between the West Scottish type from Glasgow and the 17th century Londoners from Whitechapel is of great interest. During the survey of the Scottish skulls it was noted that a considerable proportion of them had the low retreating forehead and the comparatively low cranial vault which have been described as prominent features of these Londoners.

Note to p. 14. All the means and standard deviations of the re-sexed female group in Table I are based on the original measurements of 254 complete skulls. Not all of these could be re-measured, and hence some of the final constants given in Table II are based on fewer than 254 specimens. A few significant differences may be noted between the female means in Tables I and II, and the values in the latter are in all cases the more correct.

BIOMETRISCHE UNTERSUCHUNGEN ÜBER DIE MORPHOLOGISCHEN MERKMALE VON *RANA RIDIBUNDA* PALL. (AMPHIBIA, SALIENTIA)*.

VON PAUL V. TERENTJEV, Russland.

(Mit 9 Abbildungen im Text.)

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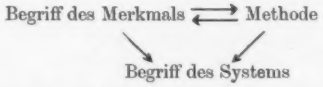
Korrelation der Indices, Ergebnisse für die Systematik und Thesen werden später veröffentlicht werden.

I. EINFÜHRUNG.

§ 1. Die Systematik dürfte wohl der an theoretischen Elementen ärmste Wissenszweig der Biologie sein und oft als trockne Aneinanderreihung blosser Tatsachenbefunde erscheinen. Man sollte meinen, dass die einfache Zusammenstellung der Letzteren und die elementaren Manipulationen mit ihrem "Klassifizieren" und "Systematisieren" kaum jemanden zu fördern vermöchten; allein es existiert anscheinend eine besondere "Logik der Dinge," die sich *nolens volens* geltend macht: sogar die, die sich ausschliesslich auf das Systematisieren der Tatsachen beschränken, erfahren mit der Zeit eine bestimmte Evolution. Selbst die Begriffe von System, systematischer Kategorie, systematischen Merkmalen sind heute nicht mehr die, die sie früher waren, und werden zweifellos in der Zukunft nicht mehr die sein, die sie heute sind. Unwillkürlich wird der Wunsch regen, nach Interpolierung irgendeines Schemas den Versuch einer beispielsweisen Extrapolation in das Zukünftige zu machen.

* Der Verfasser widmet diese Arbeit seiner heissgeliebten Mutter—LYDIA IWANOWNA TERENTJEWA.

Welchem von den Gliedern — Merkmal, System, Methode — des einheitlichen Evolutionsvorganges der Systematik kann nun die Bedeutung einer unabhängigen veränderlichen Grösse zuerkannt werden? Es ist wohl kaum möglich und nötig, diese Frage *ad ovum* zurückzuverfolgen. Jeder sich praktisch Betätigende weiss, wie eng Merkmal und Methode miteinander verflochten sind, wie sie einander gegenseitig verändern. Ein Übergewicht des einen von beiden ist wahrscheinlich nichts als ein aus der Persönlichkeit des Forschers, aus seinem Temperament, aus seiner Bildung etc. Ableitbares. Das System aber, obwohl nominell den Zweck darstellend, beeinflusst meines Erachtens die Evolution der systematischen Ideen in geringem Masse: eher erscheint es einfach als Produkt. Eine solche Betrachtungsweise lässt sich zur Darstellung bringen entweder in der Formel $S = f(M, K)$, wo S = Begriff des Systems, M = Methode und K = Begriff des Merkmals, oder noch besser geometrisch:



Ursprünglich wurde dem Begriff Merkmal ausschliesslich der Sinn des "Unterscheidenden" beigelegt. Später änderte sich die Anschauung und gegenwärtig wird er so gut wie allgemein als Norm der Variabilität bestimmt. Im weiteren Verfolg dieser Reihe gelangt man zur Auffassung des systematischen Merkmals als eines Einzelfalles unter den allgemeineren Gesetzmässigkeiten der in der Hierarchie des Systems höherstehenden Kategorien. In Parallele dazu ändert sich auch die Methode: aus den rein wortlichen Formulierungen geht es zur Zahl und von da aus zur Bestimmung des funktionellen Zusammenhangs. Entsprechend wandelt sich auch der Begriff des Systems aus dem Analytischen in einen immer mehr Synthetischen und, wie sich für die Zukunft erwarten lässt, Integralen. Das Dargelegte lässt sich kurz nachstehendem in Schema zum Ausdruck bringen:

Merkmal	→	*System*	←	*Methode*	*Periode*
Unterscheidende Besonderheit		Analytisch		Wörtlich	Diagnostische
Konstante				Indices	
Variabilitätsnorm		Synthetisch		M, σ etc.	Deskriptive
Einzelfall unter den Gesetzmässigkeiten der höheren Kategorien		Integral		$y = f(x, z \ldots)$	Funktionale

Der Rückblick in die Vergangenheit wird Linné, Pallas und andere alte Autoren der diagnostischen Periode zuweisen, während die meisten Arbeiten unserer Zeitgenossen deskriptiven Charakter tragen. Was hat man nun von der Systematik in Zukunft zu erwarten? Wohin führen ihre Wege? Wenn wir dem obigen Schema gemäss die dritte, "funktionale" Periode extrapolieren, so ergibt sich, dass die Systematik der Zukunft die Eigenschaften des Organismus-integral so wird beschreiben müssen, dass aus der blossen Kenntnis der Stelle des Objekts im System

sich auch als Funktion alle seine Eigenschaften — seine Merkmale — erschliessen lassen. Das systematische Merkmal wird meines Erachtens in sich zu befassen haben sowohl die ökologischen wie auch physiologischen und andere Besonderheiten, überhaupt alles uns über das eine oder andere Tier oder die verschiedenen Pflanzen Bekannte.

"Die Systematik der Zukunft" — ein schönes, aber in weiter Ferne winkendes Traumbild! Vieler Arbeit bedarf es noch zu seiner Verwirklichung, aber obiger Darlegung gemäss darf jeder Übergang von der "Wortverwendung" zur "Mathematik" als den jeweiligen Kräften angemessenen Schritt vorwärts gewertet werden. Die Arbeiten der englischen Biometrikerschule haben den Biologen ein treffliches Mittel an die Hand gegeben, über das Chaos des Fliessenden und Veränderlichen Herr zu werden — die Biometrik hat der modernen Biologie in der systematischen Arbeit als vornehmstes Werkzeug zu dienen.

§ 2. Pearson und die Plejade seiner Anhänger haben ein sehr feines und praktisches Instrumentar für die Beschreibung in einer Reihe von Sammelmerkmalen ausgearbeitet. Die verschiedenen Arten von Mittelwerten, zahlreichen Koeffizienten, theoretischen Entwürfen von Verteilungskurven und dergleichen mehr können den Anforderungen auch des skrupulösesten Systematikers gerecht werden. Die Beschreibung der einen oder anderen Art oder Gruppe kann in hinreichend zutreffender und einfacher Weise gemacht werden. Der Weg von einem bestimmten Material bis zum diagnostischen zusammenfassenden Ergebnis bietet keine Schwierigkeiten. Anders steht es mit der umgekehrten Aufgabe: die Bestimmung = Einordnung eines unbekannten Materials in einem bereits vorhandenen Formelbestand ist immer noch die Sache einer in langer Erfahrung zu erwerben Kunstfertigkeit. Heincke machte den Vorschlag, die Eigenschaft der Summe der Quadrate der Abweichungen von den Rassen- (oder Art- oder anderen) Mittelwerten zum Minimum zu streben, zum leitenden Prinzip zu erheben:

$$\Sigma \left(\frac{y_i - M_1}{\sigma_i}\right)^2 \rightarrow \min.$$

In vielen Fällen liefert eine derartige Methode vortreffliche Resultate. Allein Vorbedingung für die Richtigkeit ihrer Angaben ist die Abwesenheit mehr oder weniger erheblicher Korrelationen zwischen den Merkmalen, auf Grund deren die Beurteilung geschieht. Die Ausserachtlassung dieses Umstandes vermag die ungeheuerlichsten Fehler zur Folge zu haben. Damit ersteht in voller Lebensgrösse das Problem: welche Merkmale wären denn nun zu berücksichtigen, d. h. hätten als systematische zu gelten? Die meisten Forscher entscheiden gegenwärtig diese Frage, indem sie von irgendeinem im Unterbewusstsein ruhenden "Spiritus systematicus" ihren Ausgang nehmen. Es braucht nicht bewiesen zu werden, wie viele Gefahren diese Art der Behandlung in sich birgt. Einer der russischen Helminthologen (gegenwärtig nach Polen verzogen), Wittenberg, schlug vor, die Summe der für die Klassifizierung irgendeiner systematischen Einheit wichtigen Merkmale den *taxonomischen Koeffizient* dieser Einheit zu nennen. Die Grundaufgabe der modernen Theorie der Systematik lässt sich mithin kurz dahin

zusammenfassen dass sie jene Methode ausfindig zu machen hat, mittelst deren der taxonomische Koeffizient *objektiv* bestimmbar wäre. Ist dieser erst bekannt, so lässt sich der Aufbau des Systems einer Gruppe so gut wie auf mechanischem Wege z. B. nach den Wawilow'schen Prinzipien* durchführen.

Aus dem Dargelegten erhellt nun die Bedeutung, die das Studium der Merkmalskorrelationen für die Systematik besitzt. Nehmen wir ein Objekt als eine Gesamtheit von Merkmalen und berücksichtigen wir alle denkbaren Kombinationen ihrer korrelativen Zusammenhänge. Schon die oberflächliche Beobachtung zeigt, dass die Gleichmässigkeit solcher Korrelation der Merkmale einen ziemlich seltenen Fall bildet. In der Regel gruppieren sich die Merkmale in einige "Gesellschaften," die "*Korrelationsplejaden*" genannt werden können. Die Hin- und Herbezüge zwischen den Gliedern der verschiedenen Plejaden zeigen die Neigung zum Mindestmass. Postuliert man für das Erscheinende eine Ursächlichkeit, so kann man nicht umhin, etwas wie ein "*Korrelationszentrum*" als die Sammlung der Merkmale zur Plejade bewirkende Ursache sich zu denken. Das Merkmal der Plejade, zu dem die anderen Glieder derselben am meisten gravitieren, kann "*Indikator*" = indizierendes Merkmal genannt werden. Das Verhältnis des Indikators zum Korrelationszentrum ist analog dem des Epizentrums eines Erdbebens zum Hypozentrum. Ich habe mich bemüht, dieses Schema auf die Variabilität der Weichtierschalen anzuwenden† und bin zum Ergebnis gelangt, dass die Schale in ihren Ausmassen als einheitliches Ganze variiert, d. h. nur *eine* Plejade mit dem Indikator = Länge der Schale darstellt. Gegenwärtig aber scheint mir dieses Ergebnis oberflächlich, da ich unterdessen die Überzeugung von der Möglichkeit der Zerlegung der Plejaden mittelst der Methode der partialen Korrelation gewonnen habe. Darüber siehe unter IV, § 2. An anderen Objekten hatte ich mehr Glück: an den Merkmalen des Blattes *Betula verrucosa* und an einigen nichtbiologischen Komplexen gelang es mir, stärkere Differenzierung zu konstatieren‡. Vollkommen deutlich verwirklicht erscheinen die Plejaden und Indikatoren in einer Arbeit von N. A. Iljin§, wo es mit der Färbung von Meerschweinchen zu tun hat. Er erzielte drei scharf unterscheidbare Plejaden und vermochte sogar die Indikatoren anzudeuten, jedoch ohne sich der speziellen Nomenklatur zu bedienen‖. E. S. Smirnov (Moskau) wiederholt mündlich wie schriftlich ähnliche theoretische Anschauungen¶. Somit darf darauf gerechnet werden, dass das entworfene Schema keine besonderen Bedenken erregen wird.

Die Frage des taxonomischen Koeffizienten wird auf Grund des Dargelegten mit anscheinend grosser Einfachheit gelöst: *der taxonomische Koeffizient ist gleich der Summe der Indikatoren.* Damit fallen auch die Schwierigkeiten mit der Zahl

* The law of homologous series in variation (*Journal of Genetics*, Vol. XII. 1922).

† *Russ. hydrobiologische Zeitschrift*, Bd. VII. No. 3, 4, 1928, S. 81—86. *Tscherdynskij Krai* (Russ.!), No. 3, 1928, S. 47—49.

‡ Unveröffentlichtes Material.

§ *Transactions of the Laboratory of Experimental Biology of the Zoopark of Moscow*, Vol. IV. 1928, pp. 255—346.

‖ *Op. cit.* pp. 315—317.

¶ *Zeitschrift für wissenschaftliche Zoologie*, Bd. CXXXV. 1929, S. 217—255.

der Merkmale hin: bereits Heincke empfahl, sie in grösserer Anzahl zu nehmen, um den Einfluss der gegenseitigen Korrelationen aufzuwiegen. Und wirklich "erfindet" die Systematik täglich immer neue und neue Merkmale. Berücksichtigen wir die vollkommene Relativität und objektive Willkürlichkeit der "Merkmale," so dürfte solches Erfinden keine Schwierigkeiten bieten. Vom Standpunkt der Korrelationsplejaden aber *sind nur die Indikatoren echte Merkmale* und nur mit ihnen hat man es zu tun, nachdem man sich die gesamte korrelative Struktur des einen oder anderen Objektes ein für allemal klar gemacht hat.

Leider liegt die Sache in der Anwendung viel komplizierter und gar zu leicht lässt man sich zu voreiligen Schlüssen hinreissen. Besonders nötig scheint mir der Protest gegen das aprioristische Identifizieren der Korrelationszentren mit den Genen, wie es anscheinend von manchen Forschern (z. B. Iljin) ausgeübt wird.

§ 3. Der Zweck vorliegender Arbeit besteht in dem Versuch einer Korrelationsanalyse, um aus den Tatsachen irgendwelche realen Folgerungen über den Gesamtcharakter der Verteilung der Korrelationen im Organismus ziehen zu können. Dann wird der Versuch *post factum* möglich sein, die Ergebnisse jener Analyse auch auf die Systematik anzuwenden. Als "Kampfprodukte" lassen sich einzelne interessante Bemerkungen aus dem verschiedensten Gebieten erwarten.

Gegenwärtig bringe ich nur die absoluten Ausmasse der betreffenden Abschnitte meiner Arbeit an die Öffentlichkeit; die Frage der Indices wird später bekannt gegeben werden.

Die Analyse der einzelnen Variationsreihen ist nicht besonders tiefgehend durchgeführt worden, da das Hauptinteresse auf die Korrelationen konzentriert war.

Meine aufrichtige Dankbarkeit für Ratschläge und Mithilfe gebührt Prof. J. A. Filiptschenko, Prof. N. A. Liwanoff, W. A. Lindholm, R. Mertens, S. D. Pereleschin, I. S. Baschkiroff, E. S. Smirnov, und vielen anderen. Meine Gattin — Nina A. Terentjewa — war mir eine wesentliche Hilfe, indem sie die nicht leichte Mühe der Kärtchenverteilung und Nachprüfung einer ganzen Reihe von Berechnungen auf sich nahm.

II. METHODIK.

§ 1. Das Material für vorliegende Untersuchung bestand in 203 Exemplaren von *Rana ridibunda* Pall., die sämtlich dem *gleichen Fundorte* entstammten — in der Umgebung des Dorfes Zmijewo in der Pestrjatschinski Wolost des Arsker Kantons der Tatarischen Republik (ehem. Gouvernement Kasan). Die Frösche wurden mir im August 1929 zugestellt und in einem mir freundlichst zur Verfügung gestellter speziellen Raum des Kasaner Zoologischen Gartens untergebracht. Die Messungen wurden im Laboratorium des Zentralmuseums der Tatarischen Republik, die Bearbeitung durchweg bei mir zuhause ausgeführt.

Möglich, dass meine Opponenten die Zahl von 203 für gering erachten werden, meines Erachtens aber dürfte sie vollauf hinreichend sein, da bei ihr noch Korrelationen von 0·3—0·2 feststellbar sind, was für die Praxis vollkommen ausreicht.

Eine grössere Anzahl von Exemplaren hätte die Kärtchenverteilung ungemein erschwert.

§ 2. Die Messungen haben bereits längst in die Praxis der Herpetologen Eingang gefunden, allein jeder Autor handhabt sie mehr oder weniger auf seine eigene Art. Das Fehlen von technischen Normen führt häufig zur vollen Unmöglichkeit, Vergleiche vorzunehmen. Dazu kommt, dass die Wahl der Messungsnormen bisweilen eine rein zufällige ist.

Während meiner Arbeiten habe ich eine Art von Standard ausgearbeitet, dessen Gebrauchsfähigkeit vielfach von mir selbst wie auch von meinen Schülern erprobt worden ist. Später wurde das Schema mit demjenigen von S. A. Tschernow in Übereinstimmung gebracht, wodurch es eine Reihe von wertvollen Ergänzungen erhielt. Tschernow hat es mit meiner Einwilligung in einer seiner Arbeiten* veröffentlicht, leider sind dabei einige Fehler mit untergelaufen (offenbar das Resultat unaufmerksamen Korrekturlesens). In vorliegender Arbeit bringe ich mein Schema in vollem Umfange. Bei der Abfassung des Massschemas diente mir als leitendes Prinzip der Umfang möglichst aller Körperteile des Frosches. Wahrscheinlich wird künftig ein Teil der Masse gestrichen werden können, umsomehr als ihre Zahl für den praktischen Gebrauch doch etwas gross ist. Jedes Mass hat neben seiner Benennung noch eine Chiffre, unter der es weiterhin überall aufgeführt wird.

Erforderlichenfalls (in der vorliegenden Arbeit war es nicht nötig) werden die Zehen der Vorderextremität bezeichnet als: D_1a., D_2a., ... und der Hinterextremität als: D_1p., D_2p. .... Wenn die relative Zehenlänge angegeben werden muss, so kann die Zehenformel angewendet werden, z. B.: (D. a. $3 > 2 > 4 > 1$) = "der dritte Zeh der Vorderextremität ist am längsten, der zweite kürzer, der vierte noch kürzer, der erste der kürzeste."

Der überzählige Zeh der Vorderextremität vor dem ersten wird als D_0p. abgemerkt.

Für "Ranae temporariae" wird noch "Sp. c. r." = "Spatium canti rostralis" = dem Zwischenraume zwischen den dunkeln Streifen an den vorderen Augenwinkeln gemessen.

Die Messungen wurden (mit Ausnahme von 2—3 Exemplaren) am lebenden Tiere, vorwiegend an der rechten Körperseite, mit Hilfe eines Stangenzirkels vorgenommen. Alle Werte sind in Millimetern angegeben; Genauigkeit der erstanfänglichen Aufzeichnungen $\pm 0{\cdot}01$; reale Genauigkeit (Weichteile!) $\sim \pm 0{\cdot}1$.

Das Geschlecht wird abgekürzt bezeichnet "Sex."; seine Bestimmung wurde in allen zweifelhaften Fällen anatomisch ausgeführt.

§ 3. Die Ausmasse jedes Exemplars wurden unmittelbar in ein eigenes Kärtchen eingetragen und zum Schluss die Kärtchen in der erforderlichen Anordnung verteilt.

* *Izwestija Inguschskogo N.-Issled. Instituta Kraewedenija* (Russ.!), H. 2, 1929, S. 93—110.

No.	Chiffre	Benennung	Beschreibung
1	L.	Longitudo totalis	Von der Schnauzenspitze bis zum Zentrum des Anus; das Tier liegt bäuchlings auf der Tischfläche und ist durch Fingerdruck auf vertebra sacralis, die Enden der ossa ilei und das proximale Ende des os coccigis geradegestreckt.
2	L. c.	Longitudo capitis	Von der Schnauzenspitze bis zum oberen Punkt des foramen magnum (durch die Haut zu ertasten!).
3	Lt. c.	Latitudo capitis	Maximale Kopfbreite etwa im Bereich des tympanum und der hinteren Mundwinkel.
4	D. r. o.	Distantia rostri oculi	Von der Schnauzenspitze bis zum vorderen Augenrand (von unten Fingerdruck!).
5	D. n. o.	Distantia nasi oculi	Vom Nasenlochzentrum bis zum vorderen Augenrand (von unten Fingerdruck!).
6	Sp. n.	Spatium nasale	Abstand zwischen den Nasenlochzentren.
7	L. o.	Longitudo oculi	Maximale Länge des Auges in der Längslinie (von unten Fingerdruck!).
8	Lt. p.	Latitudo palpebrae	Höchstbreite des oberen Augenlides.
9	Sp. p.	Spatium palpebralis	Mindestabstand zwischen den Innenrändern der oberen Augenlider.
10	D. t. oc.	Distantia tympani oculi	Mindestentfernung vom hinteren Winkel (nicht Rande!) des Auges bis zum Trommelfell.
11	D. t. or.	Distantia tympani oris	Mindestentfernung des Trommelfells vom Rande der Mundspalte.
12	L. tym.	Longitudo tympani	Maximale Länge des Trommelfells.
13	Sp. p. c.	Spatium inter plicis cutaneis	Maximale Entfernung zwischen den dorsolateralen Falten; ungefähr in der Mitte der Rückenlänge in der zweiten Erweiterung zu messen; die Lungen sind normal angefüllt (nicht aufgeblasen!).
14	P. a.	Pedes anteriores	Länge der vorderen Extremität von der preaxialen Basis bis zum Ende des längsten Zehs.
15	P. p.	Pedes posteriores	Länge der hinteren Extremität vom Anuszentrum bis zum Ende des längsten Zehs.
16	F.	Longitudo femoris	Oberschenkellänge vom Anuszentrum bis zum distalen Ende des os femoris (auf der zusammengebogenen Extremität zu messen!).
17	T.	Longitudo tibiae	Maximale Unterschenkellänge vom proximalen bis zum distalen Ende des os cruris (auf der zusammengebogenen Extremität zu messen!).
18	P.	Pes	Vom proximalen Ende der inneren Metatarsaltuberkel bis zum Ende des längsten Zehs.
19	D. p.	Primus digitus pedis posterioris	Von der distalen Basis (nicht Ende!) der inneren Metatarsaltuberkel bis zur Ende des ersten Zehs.
20	C. int.	Callus internus	Maximale Länge der inneren Metatarsaltuberkel von der proximalen Basis bis zum distalen Ende (nicht Basis!).
21	C. ex.	Callus externus	Vorhandensein (+) oder Nichtvorhandensein (−) der äusseren Metatarsaltuberkel.
22	Art.	Articulationes tibio-tarsales	Wenn man den Unter- an den Oberschenkel presst und sie an beiden Extremitäten senkrecht zur Längsachse des Körpers lagert, so verschieben sich die Tibio-tarsalgelenke hintereinander (X), berühren sich (V) oder berühren sich nicht (I).

Die Bearbeitung geschah nach folgenden Formeln* (andere Formeln siehe im Text):

A. Quantitative Reihen:

$$M = A + kv_1; \qquad er_M = 0{\cdot}6745\,\frac{\sigma}{\sqrt{N}}.$$

$$\sigma = k\sqrt{v_2 - v_1^2 - \tfrac{1}{12}}\,\dagger; \quad er_\sigma = 0{\cdot}6745\,\frac{\sigma}{\sqrt{2N}}.$$

$$V = \frac{100\sigma}{M}\,{}^0\!/_0; \qquad er_V = 0{\cdot}6745\,V\left\{1 + 2\left(\frac{V}{100}\right)^2\right\}^{\frac{1}{2}} \Big/ \sqrt{2N}.$$

Die Werte *er* wurden aus den Tabellen Pearson's‡ berechnet: bei der Interpolation von ψ kamen nur die ersten Differenzen zur Verwendung.

B. Qualitative Reihen:

$$M_0 = \frac{100p_0}{N}\,{}^0\!/_0.$$

$$\sigma = \frac{1}{\sqrt{N}}\sqrt{M_0(100 - M_0)}\,{}^0\!/_0.$$

$$V = \frac{100\sigma}{M_0}.$$

Die Werte *er* sind wie in A erhalten, abgesehen von er_V, der für Sex. und Art. unmittelbar nach der Formel berechnet wurde.

C. Quantitative Korrelationen:

$$r = \frac{\Sigma p a_x a_y - N v_{1x} v_{1y}}{N\sigma_x\sigma_y}; \quad er_r = 0{\cdot}6745\,\frac{1 - r^2}{\sqrt{N}}.$$

$$R_{\frac{x}{y}} = r\,\frac{\sigma_x}{\sigma_y}; \quad R_{\frac{y}{x}} = r\,\frac{\sigma_y}{\sigma_x}.$$

Die Werte er_r sind nach den Pearson's Tabellen bestimmt§.

D. Biseriale Korrelationen:

$$r = \frac{M_\Sigma - M_b}{\sigma_\Sigma} : \frac{z_a}{\frac{1}{2}(1 - \alpha)}; \qquad [M_b < \tfrac{1}{2}M_\Sigma].$$

Die Regressionskoeffizienten wie in C. Die Bestimmung von z_a geschah nach den Pearson's Tabellen‖. Der Korrelationskoeffizient ist überall der Einfachheit halber als positiv angenommen, da es gleichgiltig ist, ob ♂♂ oder ♀♀ als positiv oder negativ betrachtet werden. Leider vermochte der Verfasser sich nicht den Artikel von Soper¶ zu beschaffen, in dem die genaue Formel für den wahrscheinlichen Fehler der biserialen Korrelation enthalten ist; daher wurde die Berechnung wie in C ausgeführt; man hat darum im Auge zu behalten, dass der jeweils angeführte Wert überall niedriger ist als der genaue Wert.

* [The Editor must disclaim any responsibility for the choice or appropriate use of the formulae A to E.]

† Die Korrektur Sheppard's.

‡ *Tables for Statisticians and Biometricians*, ed. II. Part I. 1927, Tab. V, VI.

§ *Op. cit.* Tab. V, VIII (ohne Interpolation!).

‖ *Op. cit.* Tab. III.

¶ *Biometrika*, Vol. X. pp. 387—390.

E. Vierfeldrige Korrelation:

$$r = \frac{ad - bc}{\sqrt{(a+b)(c+d)(a+c)(b+d)}}.$$

Der wahrscheinliche Fehler und die Regressionskoeffizienten sind wie in C errechnet.

Bei der Berechnung von C—E wurden die Werte σ, M_Σ etc. aus A und B benutzt.

Alle Berechnungen wurden zweimal ausgeführt, meist mit Hilfe der Bremiker'schen sechsstelligen Logarithmen*. Bei der Abrundung wurde die Regel der geraden Zahl eingehalten.

III. VARIABILITÄT.

§ 1. Alle durchforschten Exemplare weisen das Merkmal "C. ex." = + auf und darum wird es weiter nicht in Betracht gezogen.

Folgende Variationsreihen wurden erzielt:

1. Sex.

x	♂	♀	Σ
y	102	101	203

2. L.

x	52	58	64	70	76	82	88	94	100	106	112	Σ
y	3	24	16	27	52	39	21	8	10	3		203

3. L. c.

x	17	20	23	26	29	32	35	Σ
y	14	35	94	45	13	2		203

4. Lt. c.

x	19	24	29	34	39	44	49	Σ
y	37	95	57	13	0	1		203

5. D. r. o.

x	9	11	13	15	17	Σ
y	36	99	53	15		203

6. D. n. o.

x	4	5	6	7	8	9	Σ
y	28	71	83	20	1		203

7. Sp. n.

x	3	4	5	6	7	8	Σ
y	8	88	81	23	3		203

8. L. o.

x	5	6	7	8	9	10	11	Σ
y	18	50	88	27	17	3		203

* *Logarithmisch-Trigonometrische Tafeln*, Berlin, 1907.

9. Lt. p.

x	3	4	5	6	7	8	9	Σ
y	3	31	100	61	7	1		203

10. Sp. p.

x	1	2	3	4	5	6	Σ
y	3	144	54	1	1		203

11. D. t. oc.

x	2	3	4	5	6	7	8	Σ
y	1	59	109	29	4	1		203

12. D. t. or.

x	0	1	2	3	4	5	Σ
y	1	79	113	9	1		203

13. L. tym.

x	3	4	5	6	7	8	Σ
y	9	56	100	34	4		203

14. Sp. p. c.

x	14	19	24	29	34	39	Σ
y	36	70	76	18	3		203

15. P. a.

x	28	35	42	49	56	63	Σ
y	14	51	83	44	11		203

16. P. p.

x	76	93	110	127	144	161	178	Σ
y	1	31	34	93	34	10		203

17. F.

x	24	29	34	39	44	49	54	Σ
y	25	33	85	44	14	2		203

18. T.

x	25	30	35	40	45	50	55	Σ
y	16	27	75	61	19	5		203

19. P.

x	25	30	35	40	45	50	55	60	Σ
y	3	18	32	75	50	20	5		203

20. D_1p.

x	6	7	8	9	10	11	12	13	14	15	16	Σ
y	3	19	23	29	55	43	15	12	2	2		203

21. D_0p.

x	+	−	Σ
y	8	195	203

22. C. int.

x	2·5	3·0	3·5	4·0	4·5	5·0	5·5	6·0	6·5	7·0	7·5	Σ
y	9	18	54	57	40	20	4	0	0	1		203

23. Art.

x	X	V	I	Σ
y	161	39	3	203

Die Bearbeitung der angeführten Befunde ergab nachstehende Konstanten:

Dim.	$M \pm er\,\%$	$\sigma \pm er\,\%$	$V \pm er\,\%$
Sex.	50·2463 ± 0·1121	2·3670 ± 0·0792	4·7108 ± 0·1580
L.	79·5025 ± 0·5520	11·6602 ± 0·3903	14·6666 ± 0·5014
L. c.	24·7069 ± 0·1367	2·8880 ± 0·0967	11·6888 ± 0·3966
Lt. c.	27·7315 ± 0·1914	4·0435 ± 0·1353	14·5807 ± 0·4983
D. r. o.	12·4631 ± 0·0732	1·5455 ± 0·0517	12·4003 ± 0·4213
D. n. o.	5·9328 ± 0·0387	0·8179 ± 0·0274	13·6702 ± 0·4660
Sp. n.	5·1305 ± 0·0349	0·7374 ± 0·0247	14·3721 ± 0·4909
L. o.	7·4212 ± 0·0499	1·0548 ± 0·0353	14·2127 ± 0·4852
Lt. p.	5·7020 ± 0·0358	0·7553 ± 0·0253	13·2460 ± 0·4511
Sp. p.	2·7759 ± 0·0204	0·4306 ± 0·0144	15·5114 ± 0·5315
D. t. oc.	4·3966 ± 0·0329	0·6945 ± 0·0232	15·7963 ± 0·5418
D. t. or.	2·1552 ± 0·0246	0·5203 ± 0·0174	24·1410 ± 0·8538
L. tym.	5·3424 ± 0·0364	0·7690 ± 0·0257	14·3939 ± 0·4917
Sp. p. c.	23·5936 ± 0·2092	4·4181 ± 0·1479	18·7257 ± 0·6484
P. a.	45·0517 ± 0·3097	6·5412 ± 0·2189	14·5191 ± 0·4961
P. p.	131·7315 ± 0·8265	17·4596 ± 0·5844	13·2540 ± 0·4514
F.	36·3768 ± 0·2541	5·3680 ± 0·1797	14·7565 ± 0·5046
T.	38·8547 ± 0·2580	5·4500 ± 0·1824	14·0265 ± 0·4786
P.	43·1897 ± 0·2806	5·9268 ± 0·1984	13·7228 ± 0·4679
D_1p.	10·4163 ± 0·0824	1·7401 ± 0·0582	16·7059 ± 0·5746
D_0p.	96·0592 ± 0·0436	0·9211 ± 0·0308	0·9589 ± 0·0321
C. int.	4·2032 ± 0·0324	0·6844 ± 0·0229	16·2820 ± 0·5592
Art.	79·3104 ± 0·0908	1·9176 ± 0·0642	2·4178 ± 0·0810

§ 2. Zunächst fällt der gleiche Zahlenbestand der ♂♂ und ♀♀ auf. Das stimmt vollkommen zur Theorie, widerspricht aber dem in den Sammlungen zu beobachtenen Verhältnis. Ich habe eine Zählung der Zahl der ♂♂ und ♀♀ in den Sammlungen des Zoologischen Museums der Moskauer Universität sowie des Zoologischen Museums der Akademie der Wissenschaften der S. S. R. ausgeführt; an ♂♂ ergeben sich insgesamt 24·5 %! Ein auf den ersten Blick befremdendes Resultat, jedoch wenn wir $\frac{M_1 - M_2}{\sqrt{2}\, er_M} = 200{\cdot}6$ berechnen, so erhalten wir für die zufällige Erbeutung einer gleichen oder noch grösseren Abweichung eine ungeheueren Unwahrscheinlichkeit. Daraus lässt sich schliessen, dass bei der Beschaffung dieser Frösche für die Sammlungen eine spezielle von Museumsrücksichten geleitete "Wahl der Geschlechter" obgewaltet hat*.

Sämtliche Verteilungskurven sind mit Ausnahme von L. (Abb. 1) eingipfelig. Letzteres Merkmal zeigt drei Gipfel†. Da die Gipfel nicht in der Zweiheit auftreten, wird man die Annahme von im Geschlecht begründeten Unterschieden fahren lassen müssen und dafür das Bestehen von verschiedenen Altersgruppen innerhalb der Population vermuten dürfen. Nach meinen Beobachtungen erreicht die im jeweiligen Jahre erscheinende junge Brut der *Rana ridibunda* zum ersten Herbst

* [The "Wahl der Geschlechter" might be on the side of the author's series, if many individuals were captured *in coitu*. Ed.]

† [The frequency represented by *a* only exceeds its neighbour on the right by less than twice the probable error of their difference, that represented by *c* its neighbour on the left by less than the probable error of the difference. We certainly cannot stress *c*, and even *a* is a doubtful "Gipfel." Ed.]

ihres Lebens etwa 2—3 Zentimeter. Unser Material ist zum Ende des Sommers (August) gesammelt worden; daher darf angenommen werden, dass der Scheitel (*a*) von Tieren stammt, die bereits in den zweiten Herbst traten, die Scheitel (*b*) und (*c*) von solchen, denen der dritte bezw. vierte Herbst bevorstand. Ist das

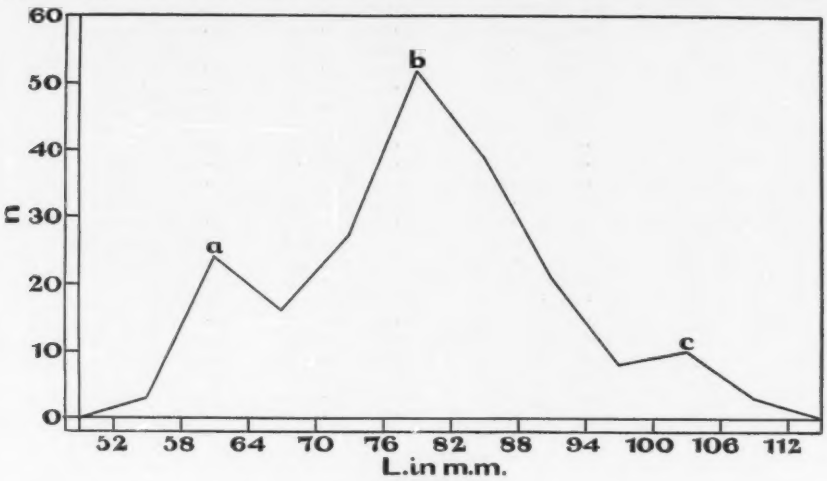


ABB. I.

richtig, so eröffnet sich die Möglichkeit, für die in Rede stehende Froschspezies die nachstehenden Wachstumsnormen als erste Annäherung aufzustellen:

Alter (zum Herbst)	L. in mm.	
	von	bis
Diesjähriger Zuwachs	20	40
Jährlinge ...	50	70
Zweijährige ...	60	100
Dreijährige ...	90	120

Die Hauptmasse der Herbstpopulation ($\sim \frac{3}{4}$) bilden die zweijährigen Tiere. Da nämlich Frösche mit den diesbezüglichen Ausmassen besonders häufig *in coitu* betroffen werden, so liegt die Annahme nahe, dass *Rana ridibunda* sich unter der Bedingungen der Umgegend von Kasan im dritten Frühling ihres Lebens zu vermehren beginnt.

Interessant ist der recht häufige Fund von sechszehigen Individuen ($D_0p. = +$ in 4 %). Dieses Merkmal erweist sich als völlig ausser Zusammenhang mit der Grösse und damit dem Alter sowohl wie mit anderen Massverhältnissen. Seine Korrelation zum Sex. ist die nachstehende:

$D_0p.$	Sex. ♂	Sex. ♀	Σ_y
+	4	4	8
−	98	97	195
Σ_x	102	101	203
$r = -0{\cdot}0010 \pm 0{\cdot}0473$			

Also vom Geschlecht ist $D_0p.$ vollständig unabhängig. Offenbar steckt die bewirkende Ursache der Sechsfingerigkeit in einer rein zufälligen Spaltung der Anlage während des Ontogenesevorganges und lässt daher die Gesamtkonstitution des Organismus unbeeinflusst. Wir beobachteten Fälle sowohl von vollständiger wie auch von teilweiser (2—3 Terminalgelenke) Spaltung.

§ 3. Die verhältnismässig geringe Zahl der Individuen bildet, wie schon erwähnt, ein Hindernis für die Analyse der Verteilungskurven vom Standpunkt der Pearson'schen Typen.

Stellen wir alle Werte für $V°/_o$ zusammen, so erhalten wir:

$V°/_o$	<3	12	13	14	15	16	17	18	19	>19	Σ
n	3	2	2	7	3	3	1	0	1	1	23

Die Merkmalsgruppe mit $V < 3°/_o$ hebt sich augenfällig aus allen anderen hervor. Zu ihrem Bestande gehören: Sex., D. t. or., $D_0p.$ und Art. Die niedrigen Werte der Koeffizienten bei Sex. und Art. begreifen sich unschwer als Folge ihrer Alternativität; $D_0p.$ ist, obzwar auch alternativ, dennoch dank seiner Seltenheit minder variabel (Bortkiewicz' Gesetz der kleinen Zahlen). Die Grösse für $V°/_o$ des Merkmals D. t. or. drängt den Verdacht geringer Genauigkeit seiner Ausmessung auf; die anderen dagegen sind anscheinend in dieser Hinsicht mehr oder weniger gleich zuverlässig. Es ist gewagt, bei einer so geringen Anzahl von Beobachtungen sich aufs Raten zu legen, aber die Form der Kurve widerspricht wenigstens nicht der Erwartung, sie werde bei Mehrung der Varianten sich der "Normal Curve" nähern. Die verhältnismässige Gleichwertigkeit der Variabilitätsamplitude begreift sich aus der engen korrelativen Verknüpftheit der Froschmerkmale (siehe IV, § 1). Hängt die Grösse $V°/_o$ von der absoluten Grösse der Ausmasse ab? Bauen wir die "Rang-" Korrelation*, so erhalten wir (alternative Merkmale sind ausgeschlossen):

$$\rho = 1 - \frac{\Sigma(\omega_1 - \omega_2)^2}{n(n^2-1)} = -0{\cdot}36\,; \quad r = 2\sin(\rho\,30°) = -0{\cdot}38\,;$$

$$er_r = 0{\cdot}706\,\frac{1-r^2}{\sqrt{n}} = \pm 0{\cdot}14\,; \quad r : er_r = 2{\cdot}7.$$

* Pearson, "On Further Methods of Determining Correlation" (*Drapers' Company Research Memoirs*, Biometric Series, IV. 1907).

Von der Formel ausgehend, nach der sich $V\,°/_{o}$ ergibt, hätte man eine schärfer ausgesprochene negative Korrelation erwarten sollen*.

Wie ist die Variabilität der einzelnen Körperteile beschaffen? Vergleichen wir die Mittelwerte von $V\,°/_{o}$ für jeden Körperteil:

Körperteil	$M_{V\,°/_{o}}$
Kopf ...	14·9
Vordere Extremität	14·5
Rumpf ...	16·7
Hintere Extremität	14·8

Der Unterschied ist ersichtlich ein zufälliger, ausgenommen den Rumpf, wo die Steigerung durch Sp. p. c. bewirkt wird.

IV. Korrelation der absoluten Werte.

§ 1. Die Verteilung der Kärtchen ergab 231† Korrelationstabellen. Die Bearbeitung ergab nachstehende Konstanten:

In der Analyse der erhaltenen Korrelationskoeffizienten wird vor allem aus ihnen eine Variationskurve dargestellt (Abb. 2). Ihre Zweigipfeligkeit begreift sich leicht aus dem oben Dargelegten: Gipfel (*a*) wird von den Beziehungen und

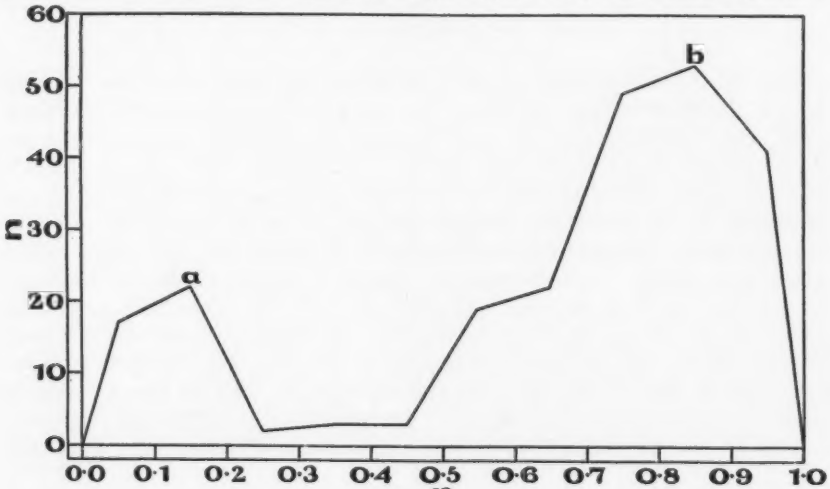


ABB. 2.

* Alpatov (*The American Naturalist*, Vol. LXII. 1928, p. 420) bringt eine empirische Regressionslinie, aus der hervorgeht, dass auch für sein Objekt (*Boreogadus saida* Lep.) die Korrelation zwischen $V\,°/_{o}$ und der Ausmassgrösse eine negative ist.

† $C_{2}^{22}=\frac{22!}{(22-2)!\,2!}=231$. Die Korrelationen mit Art. sind nicht mitgerechnet.

x	y	$r \pm \varepsilon r$	$r : \varepsilon r$	$R_{\frac{y}{z}}$	$R_{\frac{x}{y}}$
Sex.	L.	0·0283±0·0473	<0·6	0·0066	0·1215
„	L. c.	0·0637±0·0472	<1·4	0·0037	1·1028
„	Lt. c.	0·0897±0·0470	<1·9	0·0073	1·1095
„	D. r. o.	0·0382±0·0473	<0·8	0·0011	1·2349
„	D. n. o.	0·0265±0·0473	<0·6	0·0004	1·6221
„	Sp. n.	0·1788±0·0458	<3·9	0·0026	12·1228
„	L. o.	0·1058±0·0468	<2·3	0·0022	5·0166
„	Lt. p.	0·1701±0·0460	<3·7	0·0026	11·2590
„	Sp. p.	0·0536±0·0472	<1·1	0·0005	6·2223
„	D. t. oc.	0·0988±0·0469	<2·1	0·0014	7·1106
„	D. t. or.	0·0990±0·0469	<2·1	0·0010	9·5137
„	L. tym.	0·1779±0·0458	<3·9	0·0027	11·5682
„	Sp. p. c.	0·1438±0·0464	<3·1	0·0127	1·6276
„	P. a.	0·1920±0·0456	<4·2	0·0251	1·4678
„	P. p.	0·1877±0·0457	<4·1	0·0655	0·5375
„	F.	0·0979±0·0469	<2·1	0·0105	0·9119
„	T.	0·1174±0·0467	<2·5	0·0128	1·0772
„	P.	0·1868±0·0457	<4·1	0·0221	1·5758
„	D_1p.	0·1529±0·0462	<3·3	0·0053	4·3928
„	C. int.	0·2034±0·0454	<4·5	0·0028	14·8587
„	Art.	0·0025±0·0473	0·1	0·0020	0·0031
L.	L. c.	0·9633±0·0034	280·2	0·2386	3·8893
„	Lt. c.	0·9366±0·0058	162·1	0·3248	2·7009
„	D. r. o.	0·9646±0·0033	296·3	0·1278	7·2780
„	D. n. o.	0·8207±0·0154	53·2	0·0576	11·7003
„	Sp. n.	0·7744±0·0190	40·8	0·0490	12·2467
„	L. o.	0·8948±0·0094	95·0	0·0809	9·8922
„	Lt. p.	0·7940±0·0175	45·4	0·0514	12·2572
„	Sp. p.	0·5434±0·0334	16·3	0·0201	14·7162
„	D. t. oc.	0·7984±0·0172	46·4	0·0476	13·4054
„	D. t. or.	0·6376±0·0281	22·7	0·0284	14·2881
„	L. tym.	0·8494±0·0132	64·3	0·0560	12·8797
„	Sp. p. c.	0·9004±0·0090	100·1	0·3412	2·3763
„	P. a.	0·8954±0·0094	95·1	0·5023	1·5962
„	P. p.	0·9694±0·0029	335·5	1·4515	0·6474
„	F.	0·9383±0·0057	165·0	0·4320	2·0382
„	T.	0·9614±0·0036	265·5	0·4493	2·0568
„	P.	0·9359±0·0059	159·6	0·4757	1·8413
„	D_1p.	0·8834±0·0104	84·7	0·1318	5·9196
„	C. int.	0·7641±0·0197	38·8	0·0448	13·0190
„	Art.	0·0664±0·0471	<1·4	0·2306	0·0191
L. c.	Lt. c.	0·9590±0·0038	252·2	1·3427	0·6849
„	D. r. o.	0·9851±0·0014	698·9	0·5272	1·8409
„	D. n. o.	0·8149±0·0159	51·3	0·2308	2·8775
„	Sp. n.	0·7507±0·0206	36·4	0·1917	2·9402
„	L. o.	0·8883±0·0100	88·7	0·3244	2·4323
„	Lt. p.	0·8074±0·0165	48·9	0·2112	3·0872
„	Sp. p.	0·5721±0·0318	18·0	0·0853	3·8371
„	D. t. oc.	0·7991±0·0171	46·7	0·1922	3·3228
„	D. t. or.	0·6671±0·0263	25·4	0·1202	3·7029
„	L. tym.	0·8598±0·0123	69·8	0·2290	3·2292
„	Sp. p. c.	0·8869±0·0101	87·9	1·3567	0·5797
„	P. a.	0·9140±0·0078	117·3	2·0701	0·4035
„	P. p.	0·9721±0·0026	371·9	5·8769	0·1608
„	F.	0·9597±0·0037	258·6	1·7838	0·5163
„	T.	0·9775±0·0021	474·5	1·8447	0·5180
„	P.	0·9630±0·0034	280·1	1·9763	0·4692
„	D_1p.	0·8886±0·0099	89·5	0·5354	1·4748

x	y	$r \pm er$	$r : er$	$R_{\frac{y}{x}}$	$R_{\frac{x}{y}}$
L. c.	C. int.	0·7938 ± 0·0175	45·4	0·1881	3·3496
„	Art.	0·1272 ± 0·0466	< 2·7	1·7843	0·0091
Lt. c.	D. r. o.	0·9808 ± 0·0018	550·4	0·3749	2·5662
„	D. n. o.	0·7810 ± 0·0185	42·3	0·1580	3·8612
„	Sp. n.	0·7557 ± 0·0203	37·3	0·1378	4·1439
„	L. o.	0·8832 ± 0·0104	84·7	0·2304	3·3861
„	Lt. p.	0·7815 ± 0·0184	42·5	0·1460	4·1839
„	Sp. p.	0·5971 ± 0·0305	19·6	0·0636	5·6072
„	D. t. oc.	0·7821 ± 0·0184	42·5	0·1343	4·5536
„	D. t. or.	0·6936 ± 0·0245	28·3	0·0892	5·3902
„	L. tym.	0·8466 ± 0·0134	63·3	0·1610	4·4518
„	Sp. p. c.	0·8966 ± 0·0092	96·9	0·9796	0·8206
„	P. a.	0·9270 ± 0·0067	139·2	1·4995	0·5730
„	P. p.	0·9376 ± 0·0057	164·8	4·0484	0·2171
„	F.	0·9205 ± 0·0073	126·6	1·2219	0·6934
„	T.	0·9637 ± 0·0034	287·9	1·2989	0·7150
„	P.	0·9409 ± 0·0054	173·6	1·3792	0·6419
„	D_1p.	0·8863 ± 0·0102	87·1	0·3814	2·0596
„	C. int.	0·7640 ± 0·0197	38·8	0·1293	4·5143
„	Art.	0·0992 ± 0·0469	< 2·1	0·9941	0·0099
D. r. o.	D. n. o.	0·8442 ± 0·0136	62·0	0·4468	1·5953
„	Sp. n.	0·7553 ± 0·0204	37·1	0·3604	1·5831
„	L. o.	0·8927 ± 0·0096	93·1	0·6093	1·3080
„	Lt. p.	0·8146 ± 0·0159	51·2	0·3981	1·6667
„	Sp. p.	0·5335 ± 0·0338	15·8	0·1486	1·9149
„	D. t. oc.	0·8249 ± 0·0151	54·6	0·3707	1·8356
„	D. t. or.	0·6029 ± 0·0301	20·0	0·2030	1·7909
„	L. tym.	0·8573 ± 0·0126	68·2	0·4266	1·7229
„	Sp. p. c.	0·8681 ± 0·0117	74·4	2·4816	0·3036
„	P. a.	0·8870 ± 0·0101	87·9	3·7541	0·2096
„	P. p.	0·9523 ± 0·0044	214·7	10·7586	0·0843
„	F.	0·9451 ± 0·0051	186·6	3·2827	0·2721
„	T.	0·9491 ± 0·0047	201·7	3·3468	0·2691
„	P.	0·9332 ± 0·0061	152·2	3·5789	0·2433
„	D_1p.	0·8900 ± 0·0098	90·4	1·0021	0·7905
„	C. int.	0·7983 ± 0·0172	46·4	0·3535	1·8028
„	Art.	0·1400 ± 0·0464	< 3·0	3·6692	0·0053
D. n. o.	Sp. n.	0·6552 ± 0·0270	24·2	0·5907	0·7267
„	L. o.	0·7465 ± 0·0210	35·6	0·9627	0·5788
„	Lt. p.	0·6556 ± 0·0270	24·3	0·6054	0·7099
„	Sp. p.	0·5031 ± 0·0354	14·2	0·2649	0·9556
„	D. t. oc.	0·6343 ± 0·0283	22·4	0·5386	0·7470
„	D. t. or.	0·5533 ± 0·0329	16·8	0·3520	0·8697
„	L. tym.	0·7320 ± 0·0220	33·3	0·6882	0·7785
„	Sp. p. c.	0·7700 ± 0·0193	40·0	4·1598	0·1426
„	P. a.	0·7817 ± 0·0184	42.5	6·2522	0·0977
„	P. p.	0·8546 ± 0·0127	67·1	18·2437	0·0400
„	F.	0·8326 ± 0·0145	57·5	5·4648	0·1269
„	T.	0·8369 ± 0·0142	59·0	5·5768	0·1256
„	P.	0·8408 ± 0·0139	60·7	6·0934	0·1160
„	D_1p.	0·7692 ± 0·0193	39·8	1·6365	0·3615
„	C. int.	0·7048 ± 0·0238	29·6	0·5898	0·8423
„	Art.	0·0995 ± 0·0469	< 2·1	4·9283	0·0020
Sp. n.	L. o.	0·7543 ± 0·0204	36·9	1·0790	0·5273
„	Lt. p.	0·6824 ± 0·0253	26·9	0·6990	0·6662
„	Sp. p.	0·4607 ± 0·0373	12·4	0·2890	0·7889
„	D. t. oc.	0·6372 ± 0·0281	22·6	0·6002	0·6765
„	D. t. or.	0·5411 ± 0·0335	16·2	0·3818	0·7668

x	y	$r \pm er$	$r : er$	$R_{\frac{y}{x}}$	$R_{\frac{z}{y}}$
Sp. n.	L. tym.	0·6358 ± 0·0282	22·6	0·6630	0·6096
,,	Sp. p. c.	0·7213 ± 0·0227	31·7	4·3220	0·1204
,,	P. a.	0·7521 ± 0·0206	36·6	6·6720	0·0848
,,	P. p.	0·7700 ± 0·0193	40·0	18·2320	0·0325
,,	F.	0·7726 ± 0·0190	40·6	5·6242	0·1061
,,	T.	0·7681 ± 0·0194	39·6	5·6772	0·1039
,,	P.	0·7515 ± 0·0206	36·5	6·0407	0·0935
,,	D_1p.	0·7284 ± 0·0222	32·7	1·7189	0·3087
,,	C. int.	0·6881 ± 0·0249	27·6	0·6387	0·7414
,,	Art.	0·0122 ± 0·0473	<0·3	0·6689	0·0002
L. o.	Lt. p.	0·7435 ± 0·0211	35·2	0·5324	1·0382
,,	Sp. p.	0·5360 ± 0·0337	15·9	0·2188	1·3129
,,	D. t. oc.	0·7353 ± 0·0218	33·8	0·4842	1·1167
,,	D. t. or.	0·6147 ± 0·0294	20·9	0·3032	1·2462
,,	L. tym.	0·8228 ± 0·0153	53·9	0·5999	1·1286
,,	Sp. p. c.	0·8335 ± 0·0144	57·8	3·4914	0·1990
,,	P. a.	0·8346 ± 0·0143	58·2	5·1757	0·1346
,,	P. p.	0·8797 ± 0·0107	82·4	14·5620	0·0531
,,	F.	0·8466 ± 0·0134	63·3	4·3086	0·1664
,,	T.	0·8841 ± 0·0104	85·5	4·5683	0·1711
,,	P.	0·8598 ± 0·0123	69·7	4·8311	0·1530
,,	D_1p.	0·8258 ± 0·0150	54·9	1·3623	0·5005
,,	C. int.	0·7524 ± 0·0206	36·6	0·4882	1·1596
,,	Art.	0·1031 ± 0·0468	<2·2	3·9597	0·0027
Lt. p.	Sp. p.	0·3437 ± 0·0417	8·2	0·1955	0·6029
,,	D. t. oc.	0·7066 ± 0·0237	29·8	0·6497	0·7684
,,	D. t. or.	0·4405 ± 0·0382	11·5	0·3034	0·6394
,,	L. tym.	0·6909 ± 0·0247	27·9	0·7035	0·6786
,,	Sp. p. c.	0·7369 ± 0·0216	34·1	4·3105	0·1260
,,	P. a.	0·7652 ± 0·0196	39·0	6·6268	0·0884
,,	P. p.	0·8134 ± 0·0160	50·7	18·8037	0·0352
,,	F.	0·7777 ± 0·0187	41·6	5·5271	0·1094
,,	T.	0·8191 ± 0·0156	52·6	5·9105	0·1135
,,	P.	0·7557 ± 0·0203	37·3	5·9299	0·0963
,,	D_1p.	0·7475 ± 0·0208	35·8	1·7222	0·3244
,,	C. int.	0·7331 ± 0·0219	33·5	0·6642	0·8090
,,	Art.	0·0802 ± 0·0470	<1·7	4·3032	0·0015
Sp. p.	D. t. oc.	0·3920 ± 0·0401	9·8	0·6322	0·2430
,,	D. t. or.	0·4026 ± 0·0396	10·2	0·4865	0·3332
,,	L. tym.	0·5182 ± 0·0346	15·0	0·9254	0·2901
,,	Sp. p. c.	0·5250 ± 0·0343	15·3	5·3874	0·0512
,,	P. a.	0·5459 ± 0·0332	16·4	8·2926	0·0359
,,	P. p.	0·5950 ± 0·0306	19·9	24·1267	0·0147
,,	F.	0·5369 ± 0·0337	15·9	6·6929	0·0431
,,	T.	0·5545 ± 0·0328	16·9	7·0182	0·0438
,,	P.	0·5818 ± 0·0313	18·6	8·0077	0·0423
,,	D_1p.	0·5765 ± 0·0316	18·2	2·3299	0·1427
,,	C. int.	0·3949 ± 0·0400	9·9	0·6276	0·2484
,,	Art.	0·0965 ± 0·0469	<2·1	9·0802	0·0010
D. t. oc.	D. t. or.	0·5420 ± 0·0334	16·2	0·4061	0·7235
,,	L. tym.	0·6705 ± 0·0261	25·7	0·7424	0·6056
,,	Sp. p. c.	0·7288 ± 0·0222	32·9	4·6364	0·1146
,,	P. a.	0·7564 ± 0·0203	37·3	7·1246	0·0803
,,	P. p.	0·8449 ± 0·0135	62·4	21·2411	0·0336
,,	F.	0·8092 ± 0·0164	49·5	6·2545	0·1047
,,	T.	0·8244 ± 0·0152	54·2	6·4696	0·1051
,,	P.	0·7653 ± 0·0196	39·0	6·5313	0·0897
,,	D_1p.	0·7469 ± 0·0209	35·7	1·8715	0·2981

x	y	$r \pm \varepsilon r$	$r : \varepsilon r$	$R_{\frac{y}{x}}$	$R_{\frac{x}{y}}$
D. t. oc.	C. int.	0·6687 ± 0·0262	25·6	0·6589	0·6786
„	Art.	0·1326 ± 0·0465	<2·8	7·7346	0·0023
D. t. or.	L. tym.	0·5290 ± 0·0341	15·5	0·7819	0·3579
„	Sp. p. c.	0·6034 ± 0·0301	20·0	5·1236	0·0710
„	P. a.	0·6030 ± 0·0301	20·0	7·5815	0·0480
„	P. p.	0·6682 ± 0·0262	25·5	22·4234	0·0199
„	F.	0·6462 ± 0·0276	23·4	6·6673	0·0626
„	T.	0·6772 ± 0·0256	26·4	7·0939	0·0646
„	P.	0·6522 ± 0·0272	24·0	7·4297	0·0572
„	D_1p.	0·6537 ± 0·0271	24·1	2·1863	0·1955
„	C. int.	0·5565 ± 0·0327	17·0	0·7320	0·4230
„	Art.	0·1154 ± 0·0467	<2·5	8·9817	0·0015
L. tym.	Sp. p. c.	0·7569 ± 0·0202	37·4	4·3486	0·1317
„	P. a.	0·8703 ± 0·0115	75·6	7·4030	0·1023
„	P. p.	0·8852 ± 0·0103	86·2	20·0972	0·0390
„	F.	0·8724 ± 0·0113	76·9	6·0901	0·1250
„	T.	0·9031 ± 0·0087	103·4	6·4008	0·1274
„	P.	0·8939 ± 0·0095	94·1	6·8898	0·1160
„	D_1p.	0·8111 ± 0·0162	50·1	1·8354	0·3584
„	C. int.	0·7020 ± 0·0240	29·2	0·6248	0·7888
„	Art.	0·1260 ± 0·0466	<2·7	6·6362	0·0024
Sp. p. c.	P. a.	0·8498 ± 0·0131	64·7	1·2581	0·5740
„	P. p.	0·9165 ± 0·0076	120·3	3·6217	0·2319
„	F.	0·8832 ± 0·0104	84·7	1·0731	0·7270
„	T.	0·9000 ± 0·0090	100·1	1·1102	0·7296
„	P.	0·8808 ± 0·0106	83·1	1·1816	0·6566
„	D_1p.	0·8398 ± 0·0139	60·3	0·3308	2·1322
„	C. int.	0·7411 ± 0·0214	34·7	0·1148	4·7846
„	Art.	0·0861 ± 0·0470	<1·8	0·7896	0·0094
P. a.	P. p.	0·9656 ± 0·0032	305·2	2·5774	0·3618
„	F.	0·9363 ± 0·0059	159·6	0·7684	1·1409
„	T.	0·9456 ± 0·0050	190·1	0·7879	1·1349
„	P.	0·9463 ± 0·0050	190·2	0·8575	1·0444
„	D_1p.	0·8904 ± 0·0098	90·5	0·2369	3·3471
„	C. int.	0·7463 ± 0·0210	35·6	0·0781	7·1336
„	Art.	0·1603 ± 0·0461	<3·5	0·9928	0·0259
P. p.	F.	0·9824 ± 0·0017	581·7	0·3020	3·1953
„	T.	0·9645 ± 0·0034	288·2	0·3011	3·0900
„	P.	0·9760 ± 0·0022	434·7	0·3313	2·8752
„	D_1p.	0·9213 ± 0·0072	128·2	0·0918	9·2439
„	C. int.	0·8053 ± 0·0167	48·3	0·0316	20·5439
„	Art.	0·1059 ± 0·0468	<2·3	0·2458	0·0456
F.	T.	0·9739 ± 0·0024	400·8	0·9888	0·9593
„	P.	0·9588 ± 0·0038	252·2	1·0586	0·8684
„	D_1p.	0·8796 ± 0·0107	82·4	0·2851	2·7135
„	C. int.	0·7963 ± 0·0173	45·9	0·1015	6·2458
„	Art.	0·2093 ± 0·0453	<4·6	1·5794	0·0277
T.	P.	0·9814 ± 0·0018	550·8	1·0673	0·9024
„	D_1p.	0·9314 ± 0·0063	147·7	0·2974	2·9171
„	C. int.	0·7930 ± 0·0176	45·1	0·0996	6·3147
„	Art.	0·1047 ± 0·0468	<2·2	0·7783	0·0141
P.	D_1p.	0·9107 ± 0·0080	113·1	0·2674	3·1020
„	C. int.	0·8034 ± 0·0168	47·8	0·0928	6·9582
„	Art.	0·1921 ± 0·0456	<4·2	1·3127	0·0281
D_1p.	C. int.	0·7330 ± 0·0219	33·5	0·2883	1·8638
„	Art.	0·1042 ± 0·0468	<2·2	2·4254	0·0045
C. int.	Art.	0·1628 ± 0·0461	<3·5	9·6374	0·0028

Beeinflussungen der Plejaden untereinander, Gipfel (*b*) von denen innerhalb der einzelnen Plejade gebildet. Um das Gesamtbild qualitativ analysieren zu können, bedient man sich etwa *der Methode des "Korrelationsringes"*: auf eine Kreislinie werden die Merkmale in willkürlicher Reihenfolge verteilt und darauf durch Linien verbunden, die den absoluten Grössen der Korrelationskoeffizienten proportional

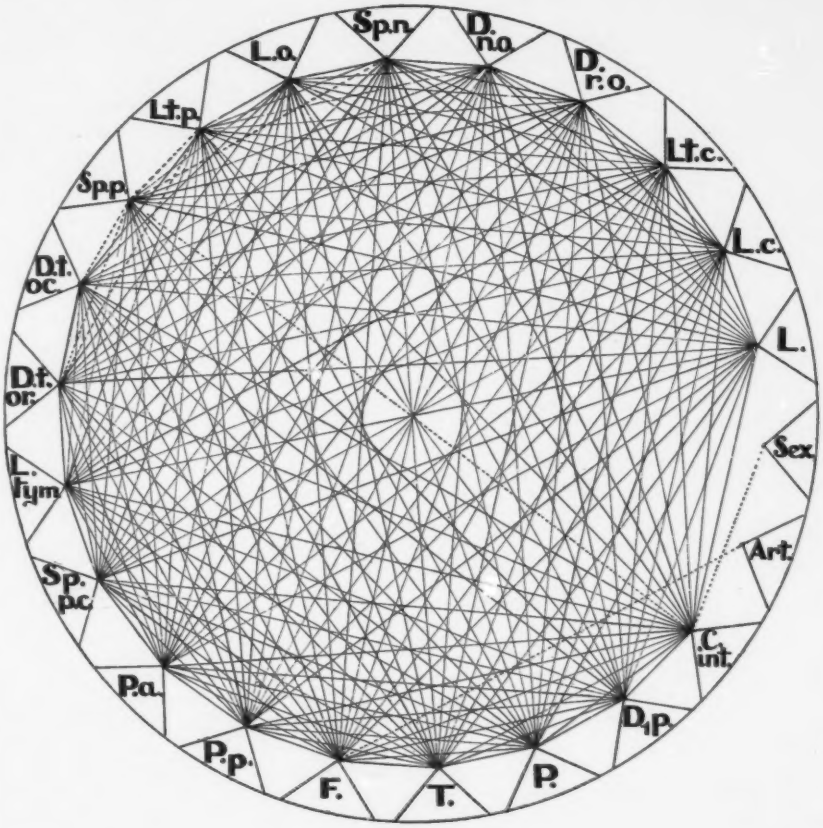


ABB. 3.

sind. Allein die Frage nach der Zahl und vor allem den Grenzen der Gruppen, in die Gesamtheit der Korrelationen zu zerlegen ist, erscheint überaus wesentlich, da ihre unrichtige Lösung zu gewaltigen Schiefheiten der Ergebnisse im weiteren Verfolg der Sache führen kann.

Die Betrachtung der Verteilungskurve der Korrelationskoeffizienten (Abb. 2) lässt für unseren Fall ganz naturgemäss drei Gruppen mit den Grenzen von 0·0

bis 0·2, 0·2 bis 0·5 und 0·5 bis 1·0 erkennen. Die erste Gruppe ist eine rein *interplejadäre*, die dritte eine rein *intraplejadäre*, die zweite eine gemischte. Aus Gründen der Einfachheit kann also auf Eintragung der ersten Gruppe ins Diagramm verzichtet werden.

In Abb. 3 ist die zweite Gruppe durch die punktierte, die dritte durch die zusammenhängende Linie bezeichnet. Man sieht sofort, dass alle Merkmale ausser Sex. und Art. *eine* Plejade bilden. Ein wenig tröstliches Resultat, sollte man meinen! Allein man erinnere sich, dass der Begriff der Plejade etwas rein Relatives ist. Das, was unter einem bestimmten Gesichtspunkt eine homogene Plejade darstellt, kann von einem anderen Punkt aus betrachtet heterogen sein. Die punktierten Linien zwischen Lt. p. und Sp. p., zwischen Sp. p. und D. t. oc. etc. deuten auf letzteres hin. Und in der Tat werden sich ja bei einer Vergrösserung des ganzen Tieres auch Lt. p. und Sp. p. vergrössern, obgleich, allgemein gesprochen, die Beziehungen zwischen ihnen antagonistisch sein werden; mit anderen Worten, der Einfluss der Gesamtgrösse des Tieres lässt alle Einzelbeziehungen maskiert erscheinen.

§ 2. Die Biometrik gibt uns die Möglichkeit, uns mit Hilfe der Methode der partialen Korrelation vom Einfluss des einen oder anderen der Gesamtheitsmerkmale zu befreien. Beseitigen wir demnach L., so stellen wir damit alle unsere Frösche hinsichtlich der Länge und mittelbar auch des Alters gewissermassen einander gleich.

Eine Berechnung nach der Formel* $_yR_{xz} = \dfrac{r_{xz} - r_{xy}r_{yz}}{\sqrt{(1-r^2_{xy})(1-r^2_{yz})}}$, wo y = L. ist, ergibt nachstehendes Resultat:

z	x										
	Sex.	L. c.	Lt. c.	D. r. o.	D. n. o.	Sp. n.	L. o.	Lt. p.	Sp. p.	D. t. oc.	D. t. or.
Sex.	1·00	0·14	0·18	0·04	0·01	0·25	0·18	0·24	0·05	0·13	0·10
L. c.	0·14	1·00	0·60	0·79	0·16	0·03	0·22	0·26	0·22	0·18	0·26
Lt. c.	0·18	0·60	1·00	0·84	0·06	0·14	0·29	0·18	0·30	0·16	0·36
D. r. o.	0·04	0·79	0·84	1·00	0·35	0·06	0·25	0·31	0·04	0·35	−0·05
D. n. o.	0·01	0·16	0·06	0·35	1·00	0·06	0·05	0·01	0·12	−0·06	0·07
Sp. n.	0·25	0·03	0·14	0·06	0·06	1·00	0·22	0·18	0·08	0·05	0·10
L. o.	0·18	0·22	0·29	0·25	0·05	0·22	1·00	0·12	0·13	0·08	0·13
Lt. p.	0·24	0·26	0·18	0·31	0·01	0·18	0·12	1·00	−0·17	0·20	−0·14
Sp. p.	0·05	0·22	0·30	0·04	0·12	0·08	0·13	−0·17	1·00	−0·08	0·09
D. t. oc.	0·13	0·18	0·16	0·35	−0·06	0·05	0·08	0·20	−0·08	1·00	0·07
D. t. or.	0·10	0·26	0·36	−0·05	0·07	0·10	0·13	−0·14	0·09	0·07	1·00
L. tym.	0·29	0·29	0·28	0·27	0·12	−0·07	0·27	0·05	0·13	−0·02	−0·03
Sp. p. c.	0·27	0·17	0·35	−0·00	0·12	0·09	0·14	0·08	0·10	0·04	0·08
P. a.	0·37	0·43	0·56	0·20	0·18	0·21	0·17	0·20	0·16	0·16	0·09
P. p.	0·65	0·58	0·34	0·27	0·42	0·12	0·12	0·29	0·33	0·48	0·26
F.	0·21	0·60	0·35	0·43	0·32	0·21	0·05	0·16	0·09	0·29	0·18
T.	0·33	0·69	0·65	0·30	0·30	0·14	0·19	0·33	0·14	0·34	0·30
P.	0·46	0·65	0·52	0·33	0·36	0·12	0·14	0·06	0·25	0·09	0·20
D_1p.	0·27	0·30	0·36	0·31	0·16	0·15	0·17	0·16	0·24	0·15	0·25
C. int.	0·28	0·33	0·21	0·36	0·21	0·24	0·24	0·32	−0·04	0·15	0·14
Art.	0·00	0·24	0·11	0·29	0·08	−0·06	0·10	0·04	0·07	0·13	0·10

* Elderton, *Frequency Curves*, ed. II. 1927, p. 209.

z	x									
	L. tym.	Sp. p. c.	P. a.	P. p.	F.	T.	P.	D_1 p.	C. int.	Art.
Sex.	0·29	0·27	0·37	0·65	0·21	0·33	0·46	0·27	0·28	0·00
L. c.	0·29	0·17	0·43	0·58	0·60	0·69	0·65	0·30	0·33	0·24
Lt. c.	0·28	0·35	0·56	0·34	0·35	0·65	0·52	0·36	0·21	0·11
D. r. o.	0·27	−0·00	0·20	0·27	0·44	0·30	0·33	0·31	0·36	0·29
D. n. o.	0·12	0·12	0·18	0·42	0·32	0·30	0·36	0·16	0·21	0·08
Sp. n.	−0·07	0·09	0·21	0·12	0·21	0·14	0·12	0·15	0·24	−0·06
L. o.	0·27	0·14	0·17	0·12	0·05	0·19	0·14	0·17	0·24	0·10
Lt. p.	0·05	0·08	0·20	0·29	0·16	0·33	0·06	0·16	0·32	0·04
Sp. p.	0·13	0·10	0·16	0·33	0·09	0·14	0·25	0·24	−0·04	0·07
D. t. oc.	−0·02	0·04	0·16	0·48	0·29	0·34	0·09	0·15	0·15	0·13
D. t. or.	−0·03	0·08	0·09	0·26	0·18	0·30	0·20	0·25	0·14	0·10
L. tym.	1·00	−0·03	0·47	0·47	0·41	0·59	0·53	0·24	0·16	0·13
Sp. p. c.	−0·03	1·00	0·22	0·41	0·26	0·28	0·25	0·22	0·19	0·06
P. a.	0·47	0·22	1·00	0·88	0·62	0·69	0·69	0·47	0·22	0·23
P. p.	0·47	0·41	0·88	1·00	0·85	0·48	0·79	0·56	0·40	0·17
F.	0·41	0·26	0·62	0·85	1·00	0·75	0·66	0·31	0·36	0·42
T.	0·59	0·28	0·69	0·48	0·75	1·00	0·84	0·63	0·33	0·15
P.	0·53	0·25	0·69	0·79	0·66	0·84	1·00	0·51	0·39	0·37
D_1 p.	0·24	0·22	0·47	0·56	0·31	0·63	0·51	1·00	0·19	0·10
C. int.	0·16	0·19	0·22	0·40	0·36	0·33	0·39	0·19	1·00	0·17
Art.	0·13	0·06	0·23	0·17	0·42	0·15	0·37	0·10	0·17	1·00

Nach Herstellung der Verteilungskurve der gefundenen Koeffizienten (Abb. 4) ergibt sich schon ein beträchtlich anderes Bild: erstens sind negative Korrelationen zum Vorschein gekommen und zweitens hat sich die Form verändert. Interessant ist, dass die negativen Werte die unmittelbare Fortsetzung der positiven bilden, so dass die gesamte Kurve als Ganzes nach links verschoben scheint.

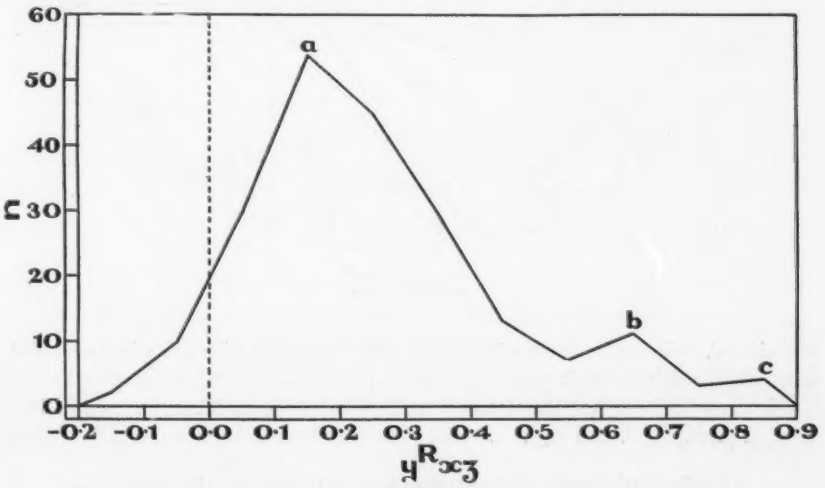


ABB. 4.

Der Gipfel (*c*) ist zweifellos ein zufälliger (Differenz nur 1 Koeffizient!); der Gipfel (*a*) aber bezieht sich auf die interplejadären und (*b*) auf die intraplejadären Korrelationen. Nach der Betrachtung der Kurve ${}_yR_{xz}$ (Abb. 4) können die Gruppengrenzen folgendermassen bestimmt werden*: die rein interplejadäre von 0·0 bis 0·5, die rein intraplejadäre von 0·6 bis 0·9 und die dazwischenliegende von

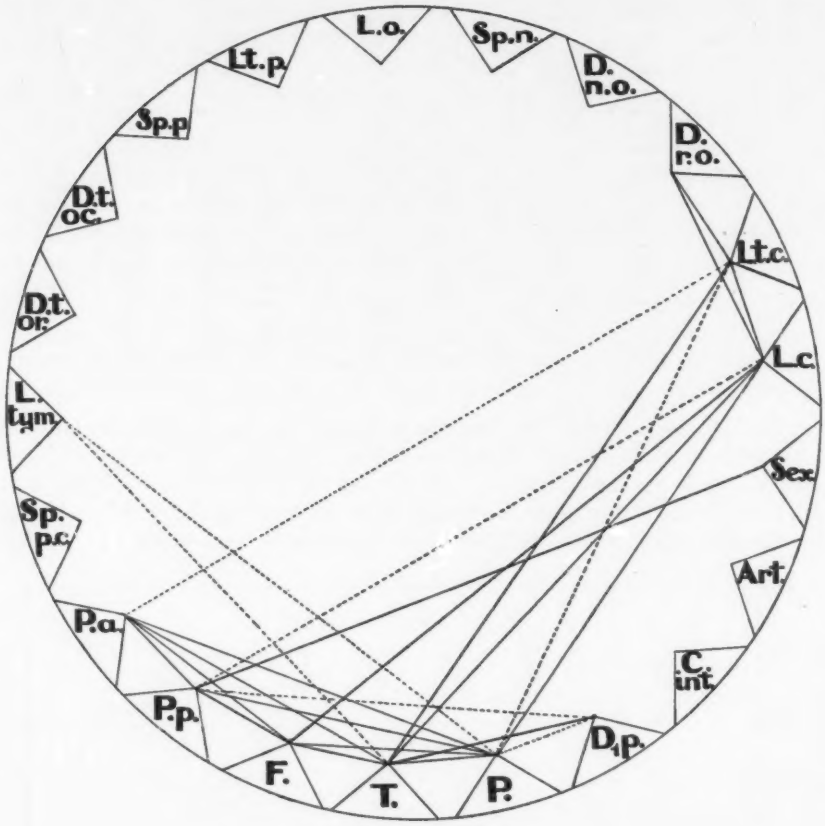


ABB. 5.

0·5 bis 0·6. Die erste lassen wir beiseite, die zweite bezeichnen wir durch fortlaufende, die dritte durch punktierte Linien. Wir erhalten (Abb. 5) eine deutlich bezeichnete Plejade, bestehend aus den Merkmalen L. c., Lt. c., D. r. o., L. tym., P. a., P. p., F., T., P. und D_1p. Was ist das Gemeinsame an ihnen? Alle sind sie

* Für die Korrelationsring dürfen nur absolute Koeffizientenwerte gebraucht werden.

"Skelett"-Merkmale, d. h. solche, deren Messung zwischen gewissen Punkten ausgeführt wird, an deren Entstehung das Skelett beteiligt ist. Die übrigen Merkmale aber können als "Haut"-Merkmale charakterisiert werden. Es lässt sich also eine enge gegenseitige Verknüpfung der "Skelett"-Merkmale konstatieren, wobei ihre Variabilität mit den "Haut"-Merkmalen ausser Zusammenhang steht. Interessant ist, dass L. tym. gleichfalls auf die Gruppe der "Skelett"-Merkmale entfällt.

Finden wir den Indikator der Skelettgruppe. Dazu berechnen wir den Mittelwert für den Konnex eines jeden Merkmals mit den anderen. Wir erhalten:

Dim.	M_r	Dim.	M_r
L. c.	0·49	P. p.	0·52
Lt. c.	0·45	F.	0·50
D. r. o.	0·38	T.	0·56
L. tym.	0·36	P.	0·55
P. a.	0·50	D_1p.	0·37

T.>P.>P. p.>P. a.>F.>L. c.>Lt. c.>D. r. o.>D_1 p.>L. tym.

Also kann als Indikator T. angenommen werden. Versuchen wir ihn mittelst der Methode der partialen Korrelation auszuschalten, um durch Zerlegung der "Skelett"-Plejade in die sie bildenden Merkmale die inneren Wechselbeziehungen der letzteren zu ermitteln. Wir erhalten:

y	x								
	L. c.	Lt. c.	D. r. o.	L. tym.	P. a.	P. p.	F.	P.	D_1 p.
L. c.	1·0	0·3	0·8	−0·2	−0·1	0·4	0·2	0·2	−0·2
Lt. c.	0·3	1·0	0·9	−0·2	0·2	0·0	−0·3	−0·1	−0·1
D. r. o.	0·8	0·9	1·0	0·1	−0·0	0·2	0·4	0·2	0·2
L. tym.	−0·2	−0·2	0·1	1·0	0·1	0·3	−0·1	0·1	−0·2
P. a.	−0·1	0·2	−0·0	0·1	1·0	0·9	0·2	0·3	0·0
P. p.	0·4	0·0	0·2	0·3	0·9	1·0	0·8	0·8	0·4
F.	0·2	−0·3	0·4	−0·1	0·2	0·8	1·0	0·1	−0·3
P.	0·2	−0·1	0·2	0·1	0·3	0·8	0·1	1·0	−0·0
D_1p.	−0·2	−0·1	0·2	−0·2	0·0	0·4	−0·3	−0·0	1·0

Nachdem wir die Kurve für die absoluten Werte der gewonnenen Koeffizienten gezogen (Abb. 6), haben wir eine deutliche Spaltung in zwei gesonderten Gruppen vor uns, von denen die eine (*a*) von den interplejadären, die andere (*b*) von den intraplejadären Konnexen entstammt. Tragen wir auf den Korrelationsring die Konnexe der letzteren Gruppe auf (Abb. 7), so sehen wir eine deutliche Scheidung in zwei Plejaden: L. c.+Lt. c.+D. r. o.=die "Kopf"-Plejade und P. a.+P. p.+F.+P.= "Extremitäten"-Plejade; die Merkmale L. tym. und D_1p. bleiben "wilde."

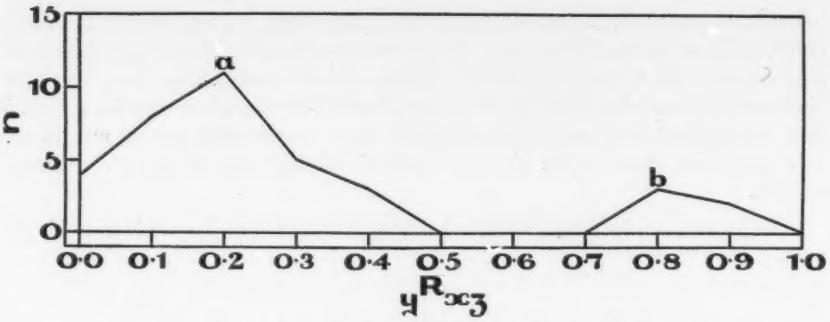


ABB. 6.

Alle erhaltenen Wechselbeziehungen der Merkmale lassen sich in einem hierarchischen Schema ihrer Cosubordination darstellen (Abb. 8).

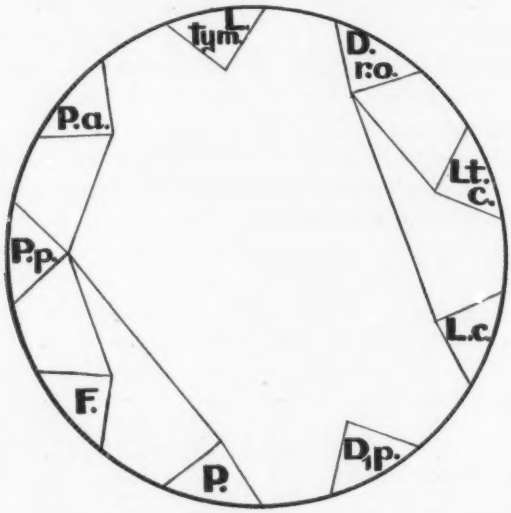


ABB. 7.

Wir sehen, dass beim steigen des Grades, in dem die Ganzheiten sich in Plejaden differenzieren, auch der Grad wächst, in dem sich die Verteilungskurve der Korrelationskoeffizientenwerte zweiteilt: in die interplejadäre und die intraplejadäre Kurve. Hieraus folgt, dass idealiter die Verteilungskurve eines bloss aus einer Plejade bestehenden Ganzen zur "Normal Curve" hinstreben muss. In solchen Fällen bildet die Methode der partialen Korrelation das Mittel, durch Ausshaltung des Einflusses der Indikator-Merkmale die primäre Plejade in hierarchisch auf niedrigerer Stufe stehender Plejaden zu zerlegen (Plejaden zweiter,

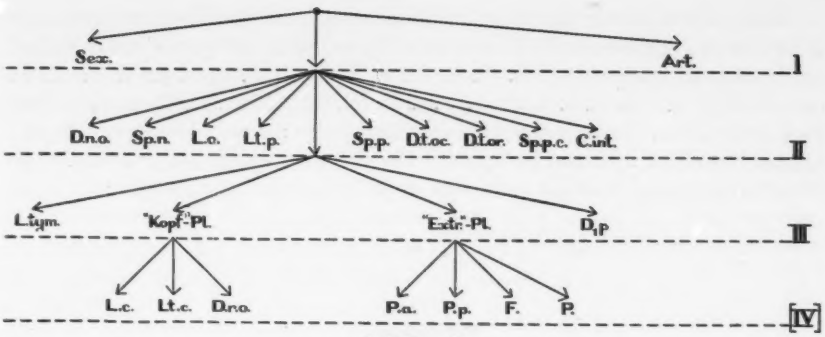


ABB. 8.

dritter usw. Ordnung). Unter den Indikatoren sind zwei Arten zu unterscheiden: logische und mathematische. Mit der ersten haben wir es zu tun, wenn wir L. beseitigen, da dessen grosse Bedeutung für unsere Ganzheit ohne weiteres klar ist. Die zweite Art kommt bei der Zerlegung der "Skelett"-Plejade zur Geltung: das Merkmal T. war als Indikator anerkannt einfach kraft seiner festeren Verknüpfung mit sämtlichen Gliedern seiner Plejade.

§ 3. Die Kenntnis der Korrelationen zwischen Merkmalen und Sexus ermöglicht den Einblick in die geschlechtlichen Unterschiede der *Rana ridibunda*. Nach den Grössen $r : er$ zu urteilen, ist anzunehmen, dass die Merkmale L., L. c., Lt. c., D. r. o., D. n. o., L. o., Sp. p., D. t. oc., D. t. or., F., T., Art. mit dem Geschlecht vollkommen ausser Konnex stehen, während die Merkmale Sp. n., Lt. p., L. tym., Sp. p. c., P. a., P. p., P., D_1p., und C. int. Andeutungen auf einen solchen enthalten, ohne dass diese jedoch als hinreichend bestätigt gelten können. Die partialen Koeffizienten ${}_yR_{xz}$ (wo $y =$ L. ist) ändern das Bild nicht wesentlich und tragen lediglich eine Verstärkung des Konnexes mit P. p. bis 0·65 hinein. Die Frage bedarf noch weiterer Bearbeitung.

Wie ist das Merkmal Art. entstanden? Welche ist die Ursache des Hintereinandertretens oder der gegenseitigen Berührung oder Nichtberührung der Tibiotarsalgelenke? Wir finden nachstehende Verknüpfungen von Art. mit den anderen Gliedern der hinteren Extremität:

Koeffᵗ	Dimension			
	P. p.	F.	T.	P.
r	0·11	0·21	0·10	0·19
${}_yR_{xz}$	0·17	0·42	0·15	0·37

In beiden Fällen ergibt sich die Reihe: F. > P. > P. p. > T. Offenbar werden die verschiedenen Werte von Art. hauptsächlich durch F. bestimmt.

Hängt der Wert für den Konnex der Merkmale von der absoluten Grösse der Ausmasse ab? Teilen wir alle Merkmale bedingungsweise in "grosse" und "kleine" und stellen zu den ersteren L., L. c., Lt. c., Sp. p. c., P. a., P. p., F., T., P., zu den letzteren D. r. o., D. n. o., Sp. n., L. o., Lt. p., Sp. p., D. t. oc., D. t. or., L. tym., D_1p. und C. int. Es ergeben sich drei Kategorien: *gg*—beide Merkmale sind "grosse," *gk*—ein Ausmass ist "gross," *kk*—beide Ausmasse sind "kleine." Die Berechnung des arithmetischen Mittels von *r* für jede Kategorie ergibt:

Kat.	$M_r \pm er$	σ
gg	0·94±0·00	0·03
gk	0·79±0·01	0·11
kk	0·67±0·01	0·13

Nicht weniger bezeichnend sind die Verteilungskurven jeder dieser Kategorien (Abb. 9). Die Berechnung der arithmetischen Mittelwerte für ${}_yR_{zz}$ (wo $y = $ L.) gibt ein vollkommen analoges Bild:

Kat.	$M_R \pm er$	σ
gg	0·54±0·03	0·20
gk	0·26±0·01	0·16
kk	0·16±0·01	0·10

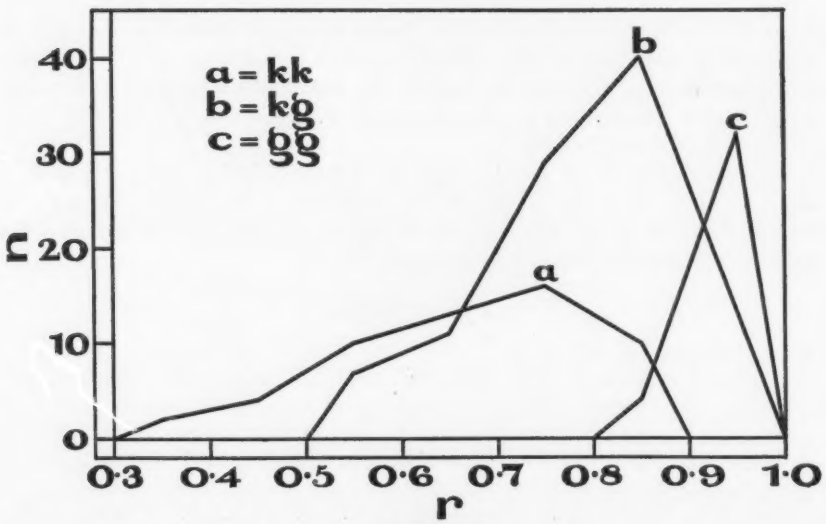


ABB. 9.

Somit ist klar, dass die grossen Ausmasse bedeutend enger miteinander verknüpft sind als die kleinen. Halten wir das gegen die negative Korrelation zwischen $V°/_{o}$ und der absoluten Grösse des Ausmasses, so können wir daraus auf die höhere Determiniertheit der grossen Ausmasse des Organismus schliessen.

Pearson u. a. haben die "Regel der Nachbarschaft" aufgestellt, der zufolge die einander näher gelegenen Merkmale korrelativ enger verknüpft sind. Zwecks Nachprüfung dieser Aufstellung zerlegen wir bedingungsweise alle Merkmalspaare unseres Objektes in "nahe" und "ferne": z. B. L. o. ⟷ Lt. p. ist ein "nahes," L. o. ⟷ P. p. ein "fernes" Paar u.s.w. Stellen wir eine Tabelle der biserialen Korrelation von "r" mit "Nähe-Ferne" auf:

r	x		
	"nahe"	"ferne"	Σ_y
0·4	2	0	2
0·5	3	1	4
0·6	9	7	16
0·7	13	10	23
0·8	14	28	42
0·9	17	33	50
	12	22	34
Σ_x	70	101	171

$r = 0{\cdot}27 \pm 0{\cdot}05$, $r : \varepsilon r = 5{\cdot}6$,
$M_{\Sigma} = 0{\cdot}78$, $M_b = 0{\cdot}74$

Tun wir das Gleiche für ${}_yR_{xz}$ (wo $y = $ L.):

${}_yR_{xz}$	x		Σ_y
	"nahe"	"ferne"	
0·1	20	12	32
0·2	16	26	42
0·3	12	23	35
0·4	9	18	27
0·5	2	9	11
0·6	2	5	7
0·7	3	7	10
0·8	3	0	3
	3	1	4
Σ_x	70	101	171

$r = 0{\cdot}07 \pm 0{\cdot}05$, $r : \varepsilon r = 1{\cdot}4$,
$M_{\Sigma} = 0{\cdot}28$, $M_b = 0{\cdot}26$

Was lässt sich aus diesen anscheinend widersprechenden Daten schliessen? Meines Erachtens ist hier auf das zweite Resultat Gewicht zu legen, d. h. das Fehlen der Korrelation zwischen Entfernung und Variabilitätskonnex. Das erste Resultat dagegen ist offenbar die Folge eines Zufalls: die antagonistischen Merkmale in der Art. von Lt. p. ⟷ Sp. p. ergeben bei der Betrachtung der Konnexe der absoluten Ausmasse ein abgeschwächtes "r," während sie ihre wahre Natur erst nach Beseitigung des Einflusses von L. geltend machen. Eben das Bestehen von antagonistischen Merkmalen in einer der Gruppen (hauptsächlich des Kopfes) ergab Herabminderung von M_b. Die Einsichtnahme in die Konnexe der einzelnen Merkmale mit den immer weiter entfernten fördert entsprechend dem Dargelegten keinerlei Gesetzmässigkeit zutage. Z. B.:

y		x				
		P. a. →	P. p. →	F. →	T. →	P.
L. c.	r	0·91	0·97	0·95	0·97	0·96
	${}_yR_{xz}$	0·43	0·58	0·60	0·69	0·65
Lt. c.	r	0·93	0·94	0·92	0·96	0·94
	${}_yR_{xz}$	0·56	0·34	0·35	0·65	0·52

Natürlich lässt sich gelegentlich auch eine abnehmende Reihe auffinden, aber es ist das eine vollkommen vereinzelte Erscheinung. Nehmen wir z. B. die hintere Extremität, so erhalten wir:

r	F.	T.	P.	${}_yR_{xz}$	F.	T.	P.
F.	1·00	0·97	0·96	F.	1·00	0·75	0·66
T.	0·97	1·00	0·98	T.	0·75	1·00	0·84
P.	0·96	0·98	1·00	P.	0·66	0·84	1·00

Diese Befunde bilden, nebenbei gesagt, ein Beispiel für die bei Alpatov* erwähnte "Regel des Vorwiegens der korrelativen Konnexe in zentrifugaler Richtung." Die Unmöglichkeit, diese Regel zu verallgemeinern geht z. B. aus nachstehenden Ziffern hervor:

y		x							
		D. r. o.	Sp. n.	L. o.	L. tym	Sp. p. c.	F.	T.	P.
Sp. p. c.	r	0·87	0·72	0·83	0·76	1·00	0·88	0·90	0·88
	${}_yR_{xz}$	0·00	0·09	0·14	−0·03	1·00	0·26	0·28	0·25

* *Proceedings of the Second Congress of Zoologists, etc. of U.S.S.R.* 1927, p. 28.

Wie lässt sich das nun mit der unzweifelhaft negativen Korrelation zwischen der Entfernung und der von Iljin* für die Färbung des Meerschweinchens festgestellten Grösse "r" in Übereinstimmung bringen? Offenbar verhalten sich die verschiedenen Besonderheiten des Organismus verschieden und das, was auf die Färbung (ob aber auf jede?) anwendbar ist, braucht es deshalb noch nicht auf die Ausmasse zu sein. Sogar innerhalb der Ausmasskategorien sind verschiedene Fälle zu unterscheiden: die aufeinander folgenden Abschnitte der Bartfäden oder die Teile der Extremitäten fügen sich den Regeln der Nachbarschaft und "Zentrifugalkraft," die anderen Ausmasse aber und der Gesamtkörper als solcher tun das nicht†. Das Gesagte zeigt, wie notwendig es ist, beim Handhaben der Korrelationskoeffizienten stets im Auge zu behalten, dass man es mit einem realen Objekt zu tun hat, dessen Eigenschaften studiert werden; Abstrahieren und voreiliges Verallgemeinern können weit vom richtigen Wege abführen. Kann doch die Entfernung als abstrakt-geometrische Grösse natürlich keinen unmittelbaren Einfluss auf den Merkmalskonnex haben; sie kann ihn nur ausüben durch Vermittlung realer Faktoren wie: Verbreitungsverhältnisse der Hormone, der Säfte, Schwerkraft und mechanische Verhältnisse des Skeletts, ökologische Bedeutung der Teile u. ä. Unter diesem Gesichtspunkt entbehrt die Durchsicht der Mittelwerte für die in morphologischen Gruppen—den Hauptabschnitten des Körpers—angeordneten Korrelationskoeffizienten nicht eines gewissen Interesses:

Körpertiel	$M_r \pm er$	σ
Kopf	0·71 ± 0·01	0·19
Vordere Extremität	0·79 ± 0·03	0·18
Rumpf	0·77 ± 0·03	0·19
Hintere Extremität	0·70 ± 0·02	0·29

Ein Unterschied ist nicht zu konstatieren. Ein Vergleich der mittleren "r"-Werte für die Merkmale innerhalb eines jeden Körperteils ist nur hinsichtlich des Kopfs und der hinteren Extremität möglich, da auf der vorderen Extremität und dem Rumpf nur je ein Ausmass vorhanden ist. Für den Kopf erhalten wir: 0·70 ± 0·01, für die hintere Extremität: 0·69 ± 0·05; also ist auch hier keine Rede von einem Unterschied. Offenbar sind die Froschkörperabschnitte in der in Rede stehenden Beziehung zu wenig differenziert.

(*Fortsetzung folgt.*)

* *Transactions of the Laboratory of Exper. Biology of the Zoopark of Moscow*, Vol. IV. 1928, p. 293.

† Alpatov gibt in einem später erschienenen Artikel (*The American Naturalist*, Vol. LXII. 1928, pp. 409—427) die Existenz von Fällen zu, in denen die erwähnten Regeln nicht anwendbar sind. Gegen die Regel der Nachbarschaft spricht sich auch Smirnov aus (*Zeitschrift für wissenschaftliche Zoologie*, Bd. CXXXV. H. 1/2, 1929, p. 243).

BEITRAG ZUR KRANIOLOGIE VON OST-ASIEN.

VON GERHARDT VON BONIN, DR MED.

Aus dem Anatomischen Laboratorium der Reichsuniversität, Leiden, und dem Department of Anatomy, University of Illinois, Chicago.

Vorwort. Die vorliegende Arbeit wurde dem Herausgeber von *Biometrika* bei Gelegenheit meiner Übersiedelung von Holland nach Amerika eingereicht. Sie war damals (im Frühjahr 1930) noch in einem recht unfertigen Zustand. Herr Dr Morant hat sich dann der grossen Mühe unterzogen, die Berechnungen sämmtlich durchzugehen, er konnte mich auf verschiedene Fehler aufmerksam machen. Diese sind verbessert worden. Ausserdem wurde in einigen Fällen eine von der ursprünglichen abweichende Gruppierung vorgenommen, und Serien, die bei der ersten Abfassung übersehen worden waren, sind nachträglich mit einbezogen worden. Der Schlussteil wurde weitgehend überarbeitet, und hier habe ich mich ganz besonders an Ratschläge gehalten, die von Herrn Dr Morant ausgingen. Die letzte Tabelle und das der Arbeit beigegebene Übersichtsschema sind sein Werk. Meiner Dankesschuld gegenüber Herrn Dr Morant gebührenden Ausdruck zu verleihen, ist der Zweck dieser Zeilen.

1. *Einleitung.* Die vorliegenden Untersuchungen hatten die Beschreibung und Aufklärung der Rassenverwandtschaft der Malayen als erstes Ziel. Es zeigte sich aber bald, dass andere Stämme mit in den Kreis der Betrachtungen gezogen werden mussten, wenn ein einigermassen abgerundetes Bild erhalten werden sollte. So wird neben dem Problem der Malayen das der Negritorasse, sowie die anthropologische Stellung der fernöstlichen Völker hier untersucht werden.

Die wichtigste der früheren Veröffentlichungen, die sich auf die angeschnittenen Fragen bezieht, ist Morants Studie über die asiatischen Völker. Viele der dort gegebenen Serien werden auch die Grundlage der hier vorgelegten Untersuchungen abgeben. Bei der Sammlung von Material aus der Literatur ist aber in erster Linie darauf geachtet worden, nur solche Serien zu verwenden, die auf der Arbeit möglichst eines Autors beruhten, dessen Technik zudem genau bekannt sein sollte, so dass ein einwandfreier Vergleich mit anderweitigen Ergebnissen möglich war. Einzelne Schädel, wie sie in der älteren Literatur und in den Schädelkatalogen beschrieben sind, wurden im allgemeinen nicht berücksichtigt. Die hier neu mitgeteilten Messungen sind zum Teil an bisher noch nicht bekannten, zum Teil aber auch an bereits einmal von früheren Untersuchern gemessenen Schädeln ausgeführt. Bisher nicht veröffentlicht die Messungen der Schädel von Java und Borneo, Nachmessungen von die Andamanesen, "Negritos" und Tagalen.

Dieses Material stammt aus verschiedenen Instituten und Museen. Die Malayen und Dajaks ruhen im Anatomischen Laboratorium zu Leiden unter Professor Barge, die Tagalen und "Negritos" sind der Obhut Professor Juinbols im Ethnographischen Museum zu Leiden unterstellt, die Andamanesen wurden mir durch die Liebenswürdigkeit von Sir Arthur Keith und von Mr Pycraft zugänglich gemacht, die Masse einiger weiteren Schädel aus Oxford teilte mir Herr Dudley-Buxton mit. Ein Teil der umfangreichen Rechnungen wurde von einem Rechner der Leidener Sternwarte, den Herr Professor de Sitter mir zur Verfügung stellte, besorgt. Zahlreiche Berechnungen und Umarbeitungen wurden in dem Department of Anatomy der University of Illinois in Chicago ausgeführt. Allen diesen genannten Herren meinen aufrichtigen Dank auszusprechen, ist mir angenehmste Pflicht.

Die Untersuchungen ziehen sich über fast zwei Jahre hin; der Gedankenaustausch mit meinem Chef Professor Barge, mit Sir Arthur Keith, mit Professor Pearson und Dr Morant hat in vieler Beziehung befruchtend gewirkt. Namentlich Dr Morant, der mir mit gütiger Erlaubnis von Herrn Professor Pearson eingehend die Messtechnik des Biometrischen Laboratoriums zeigte, und der mir teils mündlich, teils schriftlich in vielen Fragen ratend weiter half, schulde ich aufrichtigen Dank. Auch Miss M. L. Tildesley schulde ich Dank für vielerlei Hilfen und Ratschläge während der Zeit, in der ich im Laboratorium des Royal College of Surgeons in London arbeitete, so wie Herrn Professor Kampmeier, dem Leiter des Anatomischen Departments in Chicago.

2. *Technik.* Die hier befolgte Technik der Schädelmessungen schliesst sich, wie eben bereits gesagt, eng der von Pearson und seinen Schülern entwickelten Methodik an. Auch die hier angewandte Bezeichnung der Masse ist die im Biometrischen Laboratorium allgemein übliche. Wir verweisen hierüber etwa auf die Arbeit von Morant über die Klassifikation der europäischen Schädel. Dass die Technik, die ich mir im Laufe der Zeit aneignete, gut mit der von Morant übereinstimmt, liess sich bei Gelegenheit der Untersuchung des Schädels des Homo rhodesiensis feststellen. Auf die dort gegebene Zusammenstellung von Morants und meinen Massen sei verwiesen.

An Instrumenten wurde Flowers Zirkel (bezogen von Stanley in London), ein gewöhnlicher Gleitzirkel und ein Koordinatenzirkel nach Radlauer, beide von Herrmann, verwandt. Die Abnahme der kleineren Masse (Nase, Orbita, Gaumen u.s.w.) geschah zumeist mit Reisszeugzirkel und Lineal. Die Bogenmasse wurden mit Stahlbandmass abgenommen. Die mit dem Reisszeugzirkel gefassten Masse wurden auf Linealen von Steward, London, abgelesen ("engine divided ruler"). Deren Masse stimmten gut mit denen der Zirkel von Stanley und Herrmann überein, was man von anderwärts bezogenen Linealen nicht durchweg behaupten konnte!

Die Bestimmung der Kapazität war bei den Schädeln des Leidener Anatomischen Laboratoriums nicht möglich. Fast alle diese Schädel waren durch einen horizontalen Schnitt aufgesägt. Die Kalotte war durch Draht soweit aufgesetzt,

dass sich die linearen Masse abnehmen liessen, indessen gelang es nicht, sie so fest zu setzen, dass die Schädel das mit der Bestimmung der Kapazität verbundene Stossen und Schütteln hätten aushalten können. Sie musste dann auch, aus Mangel teils an Zeit, teils an den nötigen Einrichtungen, bei den übrigen Serien unterbleiben.

Der Beschreibung der linearen Masse wird die Frankfurter Horizontale—bestimmt durch die beiden Auricularpunkte, den Poria Martins, und den tiefsten Punkt des linken Orbitalrandes—zu Grunde gelegt. Angaben, wie vorderste, oberste u.s.w. beziehen sich auf die Stellung, die der Schädel im Kraniophor innehat, d. h. mit dem Scheitel nach oben. *L:* Die Schädellänge ist von der Glabella bis zum entferntesten Punkt des Occiput gemessen, wobei dieser Punkt in der Median-Sagittalebene gesucht wurde. Die Glabella ist definiert als der vorderste Punkt des Hirnschädels in der Median-Sagittalebene und in der Höhe der Supraorbitalwülste. *F:* Flowers Schädellänge vom Ophryon aus. Das Ophryon wurde in der Median-Sagittalebene da gesucht, wo diese von der geodätischen Linie zwischen den Endpunkten der kleinsten Stirnbreite *B'* geschnitten wird. Es liegt somit oberhalb der Überaugenwülste. Auf Morant's Bemerkungen über die Definition des Ophryon (*Homo rhod.* S. 358, Fussnote) sei besonders hingewiesen! Es ist vollständigkeitshalber abgenommen, aber nicht weiter verwandt worden. *B:* Die grösste Breite ist als die grösste Breite auf den Parietalia definiert, sie ist von mir indessen gelegentlich auch auf den Temporalia abgenommen worden. Das geschah nur in seltenen Fällen, soll aber doch nicht unerwähnt bleiben. Zu Vergleichszwecken ist es verwandt worden. S_1, S_2, S_3, S_1', S_2', S_3', *S*, *U*, *Gl.U*, *Q'*, $\beta Q'$: Für alle diese Masse ist nichts den früheren Definitionen hinzuzufügen. Dass *U* über das Ophryon, *Gl.U* über die Glabella gemessen wird, braucht kaum nochmals betont zu werden! *LB*, *B'*, *H'*, *H:* Auch Basislänge, kleinste Stirnbreite, sowie die Höhen *H'* und *H* geben zu keinen weiteren Bemerkungen Anlass. *OH:* Die Ohrhöhe senkrecht zur Frankfurter Horizontalen, wurde mit dem Stativgoniometer abgenommen; der obere Arm wurde auf den Apex gelegt, der untere Arm mit seiner Spitze an das rechte Porion (Auricularpunkt)*. Das Mass ist also nicht streng mit dem *OH* der biometrischen Schule vergleichbar, die von der Höhe der Ohrstangen ("ear-rods") aus messen, die nur selten den Poria scharf anliegen. Auf die Abnahme von *OH'*, der Ohrhöhe zum Bregma, ist verzichtet worden. *G'H* und *GL:* Obergesichtshöhe und Profillänge sind zum Alveolarpunkt hin genommen: aus *LB*, *G'H* und *GL* ist in der üblichen Weise das "Gesichtsdreieck" Nasion-Basion-Alveolarpunkt bestimmt. Die bedauernswerte Inkonsequenz, die darin liegt, die Profillänge zum Prosthion von Martin, die Obergesichtshöhe aber zum Alveolarpunkt von Pearson hin zu nehmen, macht, wie schon an anderer Stelle betont, die Bestimmung eines Gesichtsdreiecks, das die tatsächlichen Verhältnisse wiederzugeben imstande ist, unmöglich, und sollte allgemein verlassen werden! Die hierin liegende mangelnde Exaktheit ist um so erstaunlicher, als aus dem

* Wenn der Schädel auf dem Kraniophor ruht, ist es gleichgültig, welches Porion man nimmt. Das rechte wurde aus Bequemlichkeitsrücksichten genommen, da der Schädel diese Seite dem Beobachter bei uns zuwandte.

Institut von Martin eine Arbeit von Lüthy hervorgegangen ist, auf die noch zurückzukommen sein wird, die die Notwendigkeit, ein klar bestimmtes Gesichtsdreieck auszumessen, besonders betont. *GB* und *J:* Die Gesichtsbreite *GB* ist zwischen den tiefsten Punkten der beiderseitigen Suturae zygomatico-maxillares genommen worden, entsprechend der Martin'schen Vorschrift. Auch Morant definiert in seinen letzten Veröffentlichungen den Punkt in derselben Weise, während die biometrische Schule früher die Endpunkte dahin verlegt, wo die Naht den vorderen und unteren Rand des Knochens kreuzt (vergl., z. B., M. L. Tildesley, S. 177). Der Unterschied zwischen beiden Massen ist sicher gering. Die Jochbogenbreite ist in der üblichen Weise genommen worden. *NHR, NHL, NH':* Die Bestimmung der Nasenhöhen unterliegt namentlich bei den hier abgehandelten Rassen Ungenauigkeiten, die kaum als überwunden angesehen werden können. Während der untere Endpunkt von *NH'* eindeutig bestimmt werden kann (es allerdings noch nicht ist), stossen *NHR* und *NHL* auf Schwierigkeiten, die dem Gutdünken des Untersuchers einen ungemütlichen Spielraum lassen. Ich habe bereits 1912 darauf hingewiesen, dass der Unterrand der Apertura piriformis in wechselnder Weise von verschiedenen Knochenleisten gebildet werden kann. Ich habe damals zwei Leisten angenommen, späterhin wurde von Gower gezeigt, dass sogar drei verschiedene Knochenleisten die Grenze bilden können. Der Übergang vom Nasenboden zur Zwischenkieferfläche (denn um diesen handelt es sich) ist nun gerade bei den Malayen oft so stark abgerundet, dass die Entscheidung darüber, welche der Knochenleisten als Grenze der Apertura anzusehen ist, in vielen Fällen willkürlich bleiben muss und damit auch die Bestimmung der seitlichen Nasenhöhen ungenau macht. Man kann sich aus diesen Schwierigkeiten, scheint mir, nur dadurch retten, dass man auf *NH'* zurückgeht. Dessen unterer Endpunkt, der "Point sous-nasale" von Broca ist von mir auf das kleine Plateau hinter der Spina nasalis dorthin verlegt, wo diese von der Crista nasalis posterior oder intermedia berührt wird, nicht aber in die Tiefe der Knochensubstanz hinein, wie man es dann tun müsste, wenn man sich streng an die von Martin gegebene Definition des Nasospinale hält! (*Lehrbuch*, 2te Auflage, S. 619). Es sind hier alle drei Nasenhöhen abgenommen; zu Vergleichszwecken ist, wo irgend angängig, *NH'* und der damit gebildete Index verwandt worden. *SS, SC, DC, DS, DA:* Die Messtechnik der Nasenbrücke ist der bekannten Arbeit von Ryley, Bell und Pearson entnommen. Zu ihrer Abnahme stand mir ein Koordinatenzirkel nach Radlauer zur Verfügung. Die damit gewonnenen Ergebnisse dürften bei den längeren Serien, um die es sich hier handelt, mit den mit Mérejkowskis Instrument gewonnenen übereinstimmen, doch ist die Genauigkeit hier sicher geringer als bei den meisten anderen Schädelmassen. O_1, O_1'. *Lacr.* O_1, O_2: Die heute immer noch notwendige Vervielfältigung der Masse, die die Breite des Orbita angeben, erschwert die Vergleichung verschiedener Schädelserien ungemein. Nirgends laufen auch, so scheint es mir, leichter Versehen unter, als bei der Orbitabreite. So misst, um das vorweg zu nehmen, Harrower (Süd-Chinesen) nur O_1' (vergleicht es aber dann fröhlich mit Miss Tildesleys O_1 und erhält dadurch einen C.R.L. zwischen Süd-China und Birmanen,

der das doppelte des richtigen Wertes beträgt). Schmidt hat bei Malayen und Dajaks *Lacr.* O_1 gemessen, was auch Adachi bei den Japanern getan hat. Davidson Black schliesslich gibt von seinen Serien nur O_1 an. Unsere Definition der Breiten-Masse schliesst sich auch hier wieder an die des Biometrischen Laboratoriums an. O_1 stimmt also nicht völlig, doch innerhalb sehr enger Grenzen mit Martins Mass überein. Die den inneren Orbitalrand bestimmende Linie wird meiner Erfahrung nach dann am besten gefunden, wenn man den Schädel so weit wie möglich im Profil vor sich hält, und dann eine gerade Verbindungslinie zwischen oberem und unterem Endpunkt des scharfen Orbitalrandes zieht. Die Orbitalhöhe (O_2) ist, wie spätere Nachprüfung ergab, von mir leider in etwas anderer Weise wie von Morant abgenommen worden. Während Morant von den Umschlagskanten aus misst, habe ich, beeinflusst durch Martins *Lehrbuch*, das Mass als die Bestimmung der lichten Weite genommen, was etwas kleinere Werte ergiebt. Die Martin'sche Definition, die beides als gleichbedeutend anzusehen scheint, erlaubt offensichtlich verschiedene Interpretation. G_1, G_1', G_2, *EH:* Die Gaumenmasse geben kaum zu irgendwelchen Bemerkungen Anlass. G_1 wird von der Spitze der Spina nasalis posterior, G_1' vom Staphylion aus gemessen. Die Gaumenbreite G_2 ist die geradlinige Entfernung der Mitten der Innenränder der Alveolen der zweiten Molaren. Es entspricht also Martins Mass Nr. 63 (S. 662). Die Gaumenhöhe *EH* ist mittelst eines im Leidener Institut angefertigten Uraniscometers nach Pearson gemessen worden*. Als Messpunkte sind auch hier die Endpunkte der Gaumenbreite genommen. Das Mass ist also nicht mit dem Martin'schen Mass Nr. 64 identisch, wohl aber mit dem des Biometrischen Laboratoriums. *fml, fmb:* Länge und Breite des Foramen magnum sind in der üblichen Weise abgenommen worden.

Alv. $P\angle$, *Prost.* $P\angle$*:* Als alveolarer Profilwinkel ist der Winkel, den die Verbindungslinie von Nasion und Alveolarpunkt mit der Frankfurter Horizontalen bildet, als Prosthion-Profilwinkel der Winkel, den die Verbindungslinie von Nasion und Prosthion mit der Frankfurter Horizontalen bildet, gemessen worden. Das Prosthion ist definiert als der vorderste Punkt auf dem Zwischenkiefer in der Medianebene. Das fällt nahezu mit der von Pearson vorgeschlagenen Definition zusammen. Über Indices und Winkel ist wenig hinzuzufügen. Die Indices erklären sich von selbst und entsprechen durchaus den im Biometrischen Laboratorium üblichen. Der Occipitalindex (*Oc. I.*) ist erklärt durch die Formel

$$Oc.\ I. = 100\,\frac{S_3}{S_3'}\sqrt{\frac{S_3}{24\,(S_3 - S_3')}},$$

es wurde mit Tildesleys Tafel diese Funktion aus S_3/S_3' gefunden. Den Winkeln des Gesichtsdreiecks ist, wie erwähnt, das durch Nasion, Basion und Alveolarpunkt bestimmte Dreieck zu Grunde gelegt. Das entspricht der Gepflogenheit des Biometrischen Laboratoriums. Lüthy nimmt das durch Nasion, Basion und Prosthion bestimmte Dreieck, wobei er auch, wie er ausdrücklich betont, GH' zum Prosthion nimmt. Die von ihm gegebenen Werte sind also nicht ohne weiteres mit den biometrischen vergleichbar! Die Bestimmung der Winkel geschah zum Teil

* Die Konstruktionsskizze dazu wurde mir liebenswürdigerweise von Herrn Dr Morant zugesandt.

in London mit Pearson's Trigonometer, der mir in entgegenkommender Weise für diesen Zweck zur Verfügung gestellt wurde, zum Teil in Leiden mit Hilfe von Konstruktion mit Lineal und Zirkel und Ausmessung durch Transporteur. Die gegebenen Werte sind, so weit nicht anders bemerkt, sämtlich Mittelwerte der einzelnen Schädel und nicht aus den Mittelwerten der Dreiecksseiten in abgekürzter Weise gewonnen. Das gilt namentlich für die Serien der Literatur. Auf die Bestimmung der Winkel θ_1 und θ_2 ist verzichtet worden, sie werden zur Rassenvergleichung nicht verwandt und lassen sich nötigenfalls aus Profilwinkel und $N\angle$ und $A\angle$ nachträglich bestimmen! Die von Ryley, Bell und Pearson definierten dacryalen (ϕ) und simotischen (ϕ') Winkel der Nasenbrücke sind hingegen aus den Mittelwerten nach den von denselben Autoren gegebenen Formeln berechnet worden.

Die Abnahme der Konturen, zwecks Konstruktion der Typenkonturen erfolgte mittels eines von der Firma Bruno und Hill in Lund hergestellten Perigraphen. Zum Zeichnen wurde festes Zeichenpapier und ein sehr harter Bleistift (4H) verwandt. Man kann damit recht dünne Linien erzielen, ohne den Bleistift zu oft nachspitzen zu müssen. Die Ausmessung der Konturen lehnt sich auch wieder durchaus an die Methoden des Biometrischen Laboratoriums an. Die Median-Sagittalkurve wurde, wie üblich, in der durch N, β und λ gegebenen Ebene gezeichnet.

Es mag sich vielleicht als zweckmässig erweisen, die bei den Ausmessungen und Konstruktionen der Median-Sagittalkurven sich ergebende Gaumenhöhe bei Rassenvergleichung zu berücksichtigen. Sie ist bekanntlich der kürzeste Abstand (y_p) jenes Punktes p, in dem die Sutura palato-maxillaris die Medianebene schneidet, von einer durch den Alveolarpunkt gelegten Ebene, die parallel zu der Frankfurter Horizontalen ist. Die nachfolgende Tabelle gibt einen Vergleich der Gaumenhöhe EH mit der (y_p), die von den Median-Sagittaldiagrammen abgelesen werden kann, und ferner den Höhenindex des Gaumens, sowie einen aus den beiden Koordinaten des Punktes p gebildeten Index, zusammen mit dem Winkel δ, den die Linie $Alv.\ P-p$ mit der Frankfurter Horizontalen bildet. Die Zahlen ermutigen zu weiterer Arbeit in dieser Richtung.

TABELLE I.

Männliche Schädel.

	y_p	EH	$100\ EH/G_2$	$100\ y_p/x_p$	$\angle\delta$
Angelsachsen *	15·4	12·4	30·4 (16)	45·6 (15)	24°·5
Farringdon Street †	15·6	11·1	28·5 (53)	45·5 (52)	24°·5
Mittel-Javaner ...	16·8	11·9	29·3 (28)	48·4 (30)	25°·8
Dajaks	17·0	12·4	30·7 (28)	49·1 (27)	26°·2
Basken ‡	17·5	12·9	34·2 (10)	53·5 (19)	28°·0
Ägypter, Abydos §	19·6	14·7	34·4 (29)	54·3 (30)	28°·5

* G. M. Morant, *Biometrika*, Bd. XVIII. S. 56—98.
† B. G. E. Hooke, *Biometrika*, Bd. XVIII. S. 1—56.
‡ G. M. Morant, *Biometrika*, Bd. XXI. S. 67—82.
§ G. M. Morant, *Biometrika*, Bd. XVII. S. 1—52.

Zur Vergleichung der verschiedenen gemessenen Serien und zur Bestimmung der Rassenzusammengehörigkeit ist die Methode des Koeffizienten der Rassenähnlichkeit (C.R.L.) verwandt. Eine Darstellung der Ableitungen, die zur Aufstellung des Koeffizienten der Rassenähnlichkeit geführt haben, liegt ausserhalb des Rahmens dieser Arbeit. Für deutsche Leser sei auf einen Artikel im *Anthropologischen Anzeiger* hingewiesen.

Es seien eine Reihe von Merkmalen s gegeben, deren Mittelwerte, aus einer Serie von n Individualwerten bestimmt, die Grösse m_s haben sollen, und deren mittlere Abweichungen σ_s seien. Die Mittelwerte und mittleren Abweichungen (Eng. "Standard Deviations") einer zweiten Serie seien durch m_s', bezw. σ_s' bezeichnet. Dann sei ferner die Grösse α erklärt durch die Formel

$$\alpha_s = \left(\frac{m_s - m_s'}{\sigma_s}\right)^2 \frac{n_s n_s'}{n_s + n_s'}, \text{ wenn } \sigma_s = \sigma_s'.$$

Der Koeffizient der Rassenähnlichkeit hat dann die Form

$$\text{C.R.L.} = \frac{1}{M} \sum_1^M (\alpha_s) - 1 \pm \cdot 67449 \sqrt{\frac{2}{M}}, \qquad s = 1, 2, \ldots M.$$

Das ist die auch von Davidson Black verwandte Form. Morants neuere Arbeiten verwenden eine genauere Form, die s. Z. von Pearson gegeben wurde und die noch ein Zusatzglied enthält, das aber in fast allen Fällen nur die zweite Stelle nach dem Komma beeinflusst. Der Koeffizient bestimmt, wie schon so oft und von so vielen Seiten betont, zunächst den Grad der Wahrscheinlichkeit dafür, dass beide Serien, die durch ihn verglichen werden, von derselben Rasse stammen, und ist nicht etwa ein Mass für Rassendivergenz. Es ist gut, sich darüber Rechenschaft zu geben, dass diese Methode auf einen Vergleich der durch die Mittelwerte der einzelnen Serien beschriebenen Phaenotypen hinausläuft. Das bedeutet m. a. W., dass man als Rassen die äusserlich sichtbaren Typen der Menschen, die in einer bestimmten Gegend der Erde wohnen, hinnimmt, und zu entscheiden versucht, wie weit dieser Typ von anderen—durch andere Serien repräsentierten—abweicht. Eine genetische Erklärung der so festgestellten Zusammenhänge oder Divergenzen, die bei dem heutigen Stande der menschlichen Erblichkeitslehre übrigens wohl kaum durchzuführen wäre, bleibt späterer Forschung und anderen Methoden vorbehalten. Ich werde denn auch versuchen, die in der Anthropologie so beliebten Spekulationen über die Entstehung der Rassen durch Mischung mehr oder minder willkürlicher Urtypen zu vermeiden.

Zur Berechnung der Koeffizienten sind, wo angängig, die folgenden Masse verwandt worden: *C*, *L*, *B*, *H'*, *LB*, *B'*, *S*, *U*, *Q'*, *G'H*, *J*, *NH'*, *NB*, O_1, O_2, G_1, G_1', *fml*, *fmb*, *Prost.* $P\angle$, 100 B/L, 100 H'/L, 100 B/H', *Oc. I*, 100 $G'H/GB$, 100 NB/NH', 100 G_2/G_1, 100 O_2/O_1, 100 fmb/fml, $A\angle$, $N\angle$ *. Darauf, dass stets gleich definierte Masse verglichen werden, ist besonders geachtet worden. Wir hoffen, uns vor Fehlschlüssen bewahrt zu haben! Die σ's sind die

* Sind gelegentlich andere Masse (*NHR* oder *NHL* anstatt *NH'*, *H* anstatt *H'*, *Lacr.* O_1 anstatt O_1 u.s.w.) verwandt worden, so ist jeweils mit denselben σ's gearbeitet worden.

von Pearson und Davin mitgeteilten Werte der langen ägyptischen Serie des Biometrischen Laboratoriums. Sie sind sicherlich kleiner als die für die hier behandelten Rassen geltenden. Man läuft aber bei Anwendung anderer ("localer") Werte Gefahr, sich in Zirkelschlüssen zu bewegen. Denn hat man einmal die Homogenität durch die Grösse der mittleren Abweichung bestimmt, so ist es kaum tunlich, zur Prüfung dieser Eigenschaft andere als eben die Werte zu verwenden, die man diesem Begriff zu Grunde gelegt hat.

Der Gang der Untersuchungen wird der sein, zunächst die einzelnen Rassen zu beschreiben, wobei sich Gelegenheit geben wird, auf die Resultate und Auffassungen früherer Untersucher einzugehen, und das so gesammelte Material dann mittels des Koeffizienten der Rassenähnlichkeit zu sichten und zu gruppieren. Dabei erweist es sich als notwendig, auf den Umstand Rücksicht zu nehmen, dass der C.R.L. mit der Anzahl der zu Grunde liegenden Individualwerte wächst. Ein reduzierter Wert ist bei der Vergleichung ungleich langer Serien notwendig. Einer brieflichen Mitteilung Dr Morants verdanke ich die Kenntnis, dass in leichter Abwandlung der von Pearson vorgeschlagenen Form als Reduktionsformel angenommen worden ist:

$$\text{C.R.L.} = 50 \times \frac{\bar{n} + \bar{n}'}{\bar{n}\,\bar{n}'} \{\Sigma a_s - 1\} \pm 50 \times \frac{\bar{n} + \bar{n}'}{\bar{n}\,\bar{n}'} \times \cdot 67449 \sqrt{\frac{2}{M}},$$

wobei $\bar{n}$, $\bar{n}'$ die durchschnittliche Anzahl der ursprünglich verwandten Individuen bedeutet. Die C.R.L. wurden hier reduziert auf: $\bar{n} = \bar{n}' = 100$. Die Reduktion bedeutet eine Umbiegung des ursprünglichen Gedankens der C.R.L., die zwar bei dem jetzigen Stand unseres Wissens unentbehrlich ist, aber doch nicht aus dem Auge gelassen werden darf. Ursprünglich ein Mass der Wahrscheinlichkeit dafür, dass zwei Serien der gleichen Population angehörten, wird er damit als Mass für Rassendivergenz verwandt, was als vorläufiges Auskunftsmittel—und das ist der C.R.L., wie Pearson selbst betont hat, von allem Anfang an gewesen!—zulässig erscheint. Gibt der wahrscheinliche Fehler schon bei den Originalwerten nur ein sehr unsicheres Kriterium für vorhandene oder fehlende Unterschiede, so dürfte sich seine Bedeutung durch den Reduktionsprozess noch weiterhin verringern!

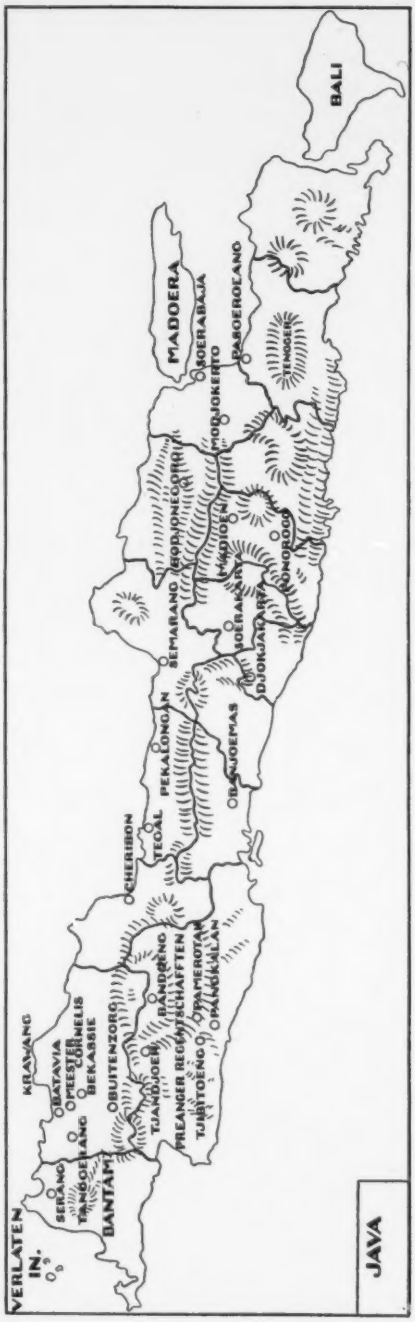
Beschreibender Teil: 3. *Einleitung.* Auf die bisherigen Vorstellungen über die rassische Zusammensetzung des hier betrachteten Gebietes im einzelnen einzugehen erübrigt sich; es wird genügen, dem Leser einige Punkte kurz ins Gedächtnis zurückzurufen.

Man hat von jeher Java als eine Durchgangsstation bei zahlreichen Völkerwanderungen angesehen. Die Völker der Südsee sollen über die Insel gezogen sein, ja, sogar die Bewohner von Madagaskar sollen mit den Malayen verwandt sein. Nüchterne Beobachter halten dafür, dass die Malayen zum mindesten zwei verschiedene Rassenelemente in sich bergen. Sie werden mit verschiedenen Namen genannt. Das Gesicht der einen brachycephalen Gruppe sei dem asiatischen Kontinent zugewandt (man spricht von mongoloider Verwandtschaft oder einer Paroischen Rasse), das der anderen dolichocephalen weise hinaus auf die See; es wird als Indonesisch oder Nesiot bezeichnet.

Über Süd-Ost Asien verstreut finden sich, wenn man den Autoren folgt, Reste weiterer primitiver Rassen: die Aetas oder Negritos der Philippinen, die Semang der malayischen Halbinsel und die Andamanesen werden als Zeugen für die Existenz einer Negritorasse, die Senoi der malayischen Halbinsel, die Toala von Celebes und die Veddahs von Ceylon als solche für eine primitive veddaide Rasse angesehen. Im Norden werden die Chinesen wohl allgemein als zur mongoloiden Gruppe gehörig angesehen, der auch die Japaner beigezählt werden, wenn auch hier ein "polynesischer" oder malayischer Einschlag öfters angenommen wird.

4. *Java.* Vor einer Darstellung der Kraniologie der Javaner wird es gut sein, sich wenigstens die gröbsten Umrisse der Geographie und älteren Geschichte Javas ins Gedächtnis zurückzurufen. Die langgestreckte Insel, von einer Fläche von 131,441 qkm. mit etwa 37·5 Millionen Einwohner trägt im Innern zahlreiche hohe Berge bis über 3,000 m., von denen bekanntlich viele Vulkane sind, und ist dank ihren fruchtbaren Küstenniederungen unter holländischer Verwaltung eines der reichsten Länder der Erde geworden. Dass Verkehr zu Lande von Ost nach West—m. a. W. in der Längsausdehnung der Insel—vor Einführung der Eisenbahn schwierig war, liegt auf der Hand.

Reste von Ureinwohnern hoffte man in den unzugänglichen Bergländern des Innern der Insel anzutreffen. Kohlbrugge lieferte 1898, durch derartige Betrachtungen angeregt, eine Beschreibung der Bewohner der Tengger Berge im Osten



Karte I. Java, ca. 1 : 5,750,000.

der Insel, und Nyèssen teilte ganz kürzlich das Ergebnis seiner Arbeiten in den Bergländern der Preanger Regentschafften im Westen der Insel mit. Weiter unten wird darauf zurückzukommen sein.

Was aus schriftlicher Überlieferung zu lernen ist, ist für die Anthropologie meist von geringem Belang. Weder sind die Zeiträume, um die es sich dabei handelt, mit denen vergleichbar, in denen sich vorgeschichtliches biologisches Geschehen abgespielt hat—von den mässig gerechnet 500,000 Jahren menschlicher Entwicklung haben wir Kunde von etwa 4–6000, d. h. etwa 1%!—noch auch handelt es sich mit ganz seltenen Ausnahmen um Geschehnisse, die soweit den Charakter von Massenerscheinungen haben, dass von ihnen ein Einfluss auf den somatischen Typ zu erwarten ist. Immerhin sind Wandlungen des Rassentyps einer bestimmten Gegend beobachtet worden; Morants Arbeiten über die Bevölkerungen Englands, oder die Unterschiede zwischen den Reihengräberleute und den modernen Bayern, um nur einige Beispiele zu nennen, zeigen das deutlich.

Dass Trinil auf Java der Fundort des Pithecanthropus ist, dürfte fast zu bekannt sein, um hier erwähnt zu werden. Hingewiesen zu werden verdient jedoch auf die bei Wadjak gefundenen Schädel, die leider bisher nicht so genau bekannt sind, dass ein Vergleich mit anderen Rassen nach den hier befolgten Prinzipien durchzuführen wäre. Dubois selbst glaubt in ihnen eine australische Form sehen zu müssen, eine Meinung, der sich Sir Arthur Keith anschliesst, ohne jedoch den Wadjakmenschen einer jetzt lebenden Form direkt anzuschliessen. Aus historischer Zeit wird angegeben, dass sich den Ureinwohnern Javas an drei Stellen, im Westen, in der Mitte, und im Osten Einwanderer zugesellten. Diese Angaben von Fruin-Mees sind ohne Quellennachweis gemacht. Sicher ist jedenfalls, dass schon in alten indischen Gesängen auf Java, das Goldland, hingewiesen wird, und dass bis 1478 (Wallace) der Buddhismus auf der Insel blühte, um dann vom Mohammedanismus abgelöst zu werden, der durch die Araber gebracht wurde. Dass seit etwa 100 Jahren auch Chinesen, die jetzt etwa 3 % der Bevölkerung der Insel ausmachen (Perthes: *Taschen-Atlas*, 1928) einwanderten und dort oft zu grossem Wohlstand gelangten, ist wohl allgemein bekannt. Es handelt sich dabei fast ausschliesslich um Südchinesen.

Es ist mir nicht gelungen, mich durch die verworrenen Darstellungen, die viele Autoren von der Anthropologie Javas geben, hindurch zu winden. Auf die ausführliche Bibliographie von Kleiweg de Zwaan sei hier hingewiesen.

Zu den bereits in der Einleitung besprochenen Rassentheorien hier Stellung zu nehmen, führt aus dem Bereich der hier vorgelegten Untersuchungen hinaus, die sich einstweilen nicht östlich über die Wallacesche Linie (Karte, gegenüber p. 14) erstrecken sollen. Wir leiten aber aus den wenn auch oft unklar wiedergegebenen Beobachtungen von Anthropologen, die an Ort und Stelle gearbeitet haben, die Verpflichtung ab, zu prüfen, wie weit die Javaner als einheitliche Rasse angesehen werden dürfen. Bevor wir jedoch das Schädelmaterial untersuchen, sei kurz ein Blick auf die Resultate der Messungen an Lebenden geworfen, die von Nyèssen gemacht wurden.

Nyèssen hat an einigen Gruppen von Bergbewohnern im Süden des Pangkalangan-Plateaus gearbeitet. Die Liste der zur Berechnung des Koeffizienten der Rassenähn-

lichkeit verwandten Masse enthält Tabelle II. Sie sind einigermassen willkürlich ausgewählt, eine Reihe von Messungen der Länge der einzelnen Körperabschnitte ist weggelassen, weil sie zu eng mit Schulterbreite oder Körperlänge korreliert schienen.

TABELLE II.

Javaner, Lebeńde, ♂ (Nyèssen).

	Tjibitoeng	Pangkalan	Pamerotan
Körperhöhe (cm.)	157·1 (56)	156·2 (54)	159·1 (49)
100 Tr/St*	52·8 (57)	52·4 (54)	52·2 (49)
100 Sh/Rl†	72·9 (55)	74·9 (53)	75·2 (49)
Kopflänge (*L*) (mm.) ...	178·7 (57)	178·9 (54)	181·1 (49)
Kopfbreite (*B*) (mm.) ...	148·3 (57)	148·4 (54)	149·5 (49)
Ohrhöhe (*OH*) (mm.) ...	137·3 (55)	138·0 (54)	138·4 (49)
100 *B*/*L*	82·6 (57)	82·4 (54)	82·1 (49)
100 *OH*/*L*	76·9 (55)	76·6 (54)	76·1 (49)
100 *OH*/*B*	92·2 (55)	92·6 (54)	92·3 (49)
Jochbogenbreite (*J*) (mm.)	135·6 (57)	135·3 (54)	137·5 (49)
Gesichtshöhe (*GH*) (mm.) ...	116·4 (56)	114·1 (54)	117·1 (49)
100 *GH*/*J*	85·4 (56)	83·8 (50)	84·7 (49)
Höhe der Nase (*NH*) (mm.)	50·7 (57)	50·0 (54)	51·8 (49)
Breite der Nase (*NB*) (mm.)	37·2 (57)	36·9 (54)	36·9 (49)
100 *NB*/*NH*	72·6 (57)	73·7 (54)	71·0 (49)
Schulterbreite (cm.)	35·0 (57)	34·9 (53)	35·6 (49)

* Tr/St, Sitzhöhe/Körperhöhe. † Sh/Rl, Schulterbreite/Rumpflänge.

Tabelle III gibt die von Nyèssen berechneten mittleren Abweichungen*, denen wir noch die von Hannesson an Isländern, und die von Roth an einer Gruppe von Pfälzern (Pfalz B) gewonnenen, zum Vergleich hinzufügen. In den meisten Fällen stimmen die Werte so weit überein, dass man mit Rücksicht auf die wahrscheinlichen Fehler nicht von wesentlichen Unterschieden reden kann. Nur die Variabilität der Körperhöhe in Nyèssens Pangkalan-Gruppe ist wesentlich niedriger als die aller übrigen, und die Variabilität des Schädelindex und des Nasenindex in der Tjibitoeng-Gruppe ist wesentlich höher als die der hier zum Vergleich gegebenen europäischen Rassen. Hierbei ist allerdings hinzuzufügen, dass nur beim Nasenindex der Vergleich mit den Isländern Geltung hat. Zur Berechnung der C.R.L. sind die Werte der Tjibitoeng-Gruppe verwandt worden.

Das Resultat zeigt Tabelle IV.

Man kann daraus jedenfalls nicht auf grosse Rassenverschiedenheit schliessen, indessen handelt es sich hier ja nur um Bewohner eines engen Bezirkes, Rückschlüsse auf die ganze Insel erscheinen kaum zulässig. Man könnte versucht sein aus den Variabilitäten, wie sie in Tabelle III enthalten sind, ein Urteil über die Homogenität der von Nyèssen untersuchten Stämme zu gewinnen. Indessen sind

* Bei einer eingehenderen Prüfung von Tabelle II und III offenbaren sich mehrere Unstimmigkeiten. Da aber dem Werk keine Tabellen der Individualwerte beigegeben sind, ist eine Nachprüfung der Rechenarbeit des Verfassers nicht möglich.

die Zahlen kaum eindeutig, das Merkmal, das, wie schon erwähnt, in Java variabler als in Europa erscheint, ist der Kopfindex, dem sich übrigens der Index 100 *OH/L* möglicherweise anschliesst. Die übrigen Masse hingegen zeigen keine wesentliche, ja nicht einmal eindeutige Unterschiede.

TABELLE III.

Mittlere Abweichung f. Javaner, Lebende (nach Nyèssen wahrscheinliche Fehler hinzugefügt) verglichen mit Europäen.

	Tjibitoeng	Pangkalan	Pamerotan	Isländer (Hannesson)	Pfalz B (Roth)
Körperhöhe (cm.)	5·94 ± ·38	3·65 ± ·24	4·79 ± ·33	5·73 ± ·09	6·08 ± ·14
100 Tr/St*	1·53 ± ·10	1·28 ± ·08	1·66 ± ·11	—	1·29 ± ·03
100 Sh/Rl†	4·30 ± ·28	3·94 ± ·26	3·79 ± ·26	—	—
Kopflänge (*L*) (mm.) ...	5·99 ± ·38	6·85 ± ·44	7·14 ± ·49	6·08 ± ·10	6·16 ± ·13
Kopfbreite (*B*) (mm.) ...	5·56 ± ·35	5·07 ± ·33	5·71 ± ·39	5·22 ± ·09	5·25 ± ·11
Ohrhöhe (*OH*) (mm.) ...	5·89 ± ·38	5·04 ± ·33	5·19 ± ·35	5·28 ± ·09	6·27 ± ·13
100 *B/L*	4·31 ± ·27	3·49 ± ·23	3·83 ± ·26	2·38 ± ·04	3·28 ± ·07
100 *OH/L*	4·09 ± ·26	2·88 ± ·19	3·07 ± ·21	2·88 ± ·05	3·31 ± ·07
100 *OH/B*	4·09 ± ·26	3·94 ± ·26	4·08 ± ·28	—	4·01 ± ·08
Jochbogenbreite (*J*) (mm.)	5·56 ± ·35	4·83 ± ·31	4·91 ± ·34	6·01 ± ·10	5·44 ± ·11
Gesichtshöhe (*GH*) (mm.)	5·70 ± ·36	6·35 ± ·41	7·12 ± ·49	6·78 ± ·16	6·82 ± ·14
100 *GH/J*	4·99 ± ·32	4·24 ± ·28	4·70 ± ·32	5·50 ± ·09	5·28 ± ·11
Höhe der Nase (*NH*) (mm.)	3·39 ± ·21	3·66 ± ·24	3·60 ± ·25	3·75 ± ·06	4·09 ± ·08
Breite der Nase (*NB*) (mm.)	2·61 ± ·16	2·68 ± ·17	2·33 ± ·16	2·38 ± ·05	2·54 ± ·05
100 *NB/NH*	6·95 ± ·44	6·95 ± ·45	6·56 ± ·45	5·61 ± ·09	6·30 ± ·13
Schulterbreite (cm.) ...	1·56 ± ·10	1·51 ± ·10	1·46 ± ·10	—	1·79 ± ·04

* Tr/St, Sitzhöhe/Körperhöhe. † Sh/Rl, Schulterbreite/Rumpflänge.

TABELLE IV.

Koeffizienten der Rassenähnlichkeit, basiert auf 16 *Charactere.*

	Tjibitoeng	Pangkalan	Pamerotan
Tjibitoeng (56·3)	—	0·14 ± ·24	1·14 ± ·24
Pangkalan (53·6)	0·14 ± ·24	—	1·51 ± ·24
Pamerotan (49·0)	1·14 ± ·24	1·51 ± ·24	—

Das in der Literatur niedergelegte Material aus javanischen Schädeln ist recht reichlich, konnte aber hier nur zum kleinsten Teil verwandt werden. Die ersten kraniologischen Beschreibungen stammen von Bleeker und Swaving. Namentlich dem letzteren, der längere Jahre in Batavia war, verdankt die Wissenschaft ausserordentlich viel. Von ihm stammen die meisten Schädel der Sammlung von J. v. d. Hoeven, die erst von ihm, dann von E. Schmidt publiziert worden sind. Näheres über die Persönlichkeit Swavings zu erfahren, ist mir nur sehr unvollkommen gelungen. Er war erster Stadtarzt in Batavia, war Mitglied der Koninklijke

Natuurwetenschappelijke Vereeniging in Nederlandsch-Indie, und hat selbst auch verschiedene Arbeiten zur Kraniologie des indischen Archipels veröffentlicht. Die Sorgfalt, mit der auf den von ihm gesandten Schädeln Personalia des Trägers vermeldet sind, lässt das Material, das durch seine Hände gegangen ist, als durchaus zuverlässig erscheinen. Auf das, was Halbertsma über Swaving und über andere Sammler sagt, sei hingewiesen! Sechs von den 19 Pariser Schädeln, die de Quatrefages und Hamy bearbeitet haben, sowie die grösste Anzahl der in den deutschen Katalogen angegebenen Schädel, und—last but not least—auch die Schädel der Leidener Sammlung, stammen gleichfalls ursprünglich von Swaving.

Zum Vergleich mit den von uns gemessenen Schädeln ist hier nur die Sammlung von Schmidt herausgezogen worden, denn nur hier schienen genügend zahlreiche und genügend zuverlässige Messungen vorzuliegen. E. Schmidt gibt an: *Gl.U, S, Q', L, B, H', B', LB, fml, fmb, GB, J, G'H, Lacr.* O_1, O_2, *NH, NB,* G_1', G_2, *GL.* Ein Teil der üblichen Indices ist von Schmidt gleichfalls gegeben. Die Indices. $100\,H'/L$, $100\,B/H'$, $100\,(B-H')/L$ sowie die Winkel des Gesichtsdreiecks sind für die einzelnen Schädel berechnet worden. Es ist dann mit den daraus gewonnenen Mittelwerten des weiteren operiert worden.

Die Schädel von Java, die ich untersuchen konnte, entstammen sämmtlich dem Leidener Anatomischen Institut. Sie sind durchweg von bekanntem Geschlecht, wie die im Anhang gegebenen Aufschriften auf den Schädeln zeigen. In den meisten Fällen ist auch die Herkunft und der Name des Trägers bekannt. Der grösste Teil stammt, wie schon erwähnt, von Swaving. Es ist anzunehmen, dass sowohl die Schädel der Schmidt'schen Sammlung, wie die, die sich jetzt in Leiden befinden, zur selben Zeit von Swaving an J. v. d. Hoeven, der Professor der Zoologie, und an Zaaijer, der Professor der Anatomie war, gesandt wurden; nach welchem Gesichtspunkt aber die Verteilung erfolgte, ist nicht bekannt und dürfte auch kaum mehr festzustellen sein. Immerhin ist es möglich, dass die "schönen" oder "interessantesten" Schädel etwas leichter Eingang in die Privatsammlung fanden, denn es ist auffallend, dass sich in der Schmidt'schen (früher v. d. Hoeven'schen) Sammlung ein Schädel aus Batavia, 5 aus Mittel-, 7 aus Ost-Java und 27 ohne nähere Angaben befinden, ein Verhältnis, das wesentlich von dem in der Leidener Sammlung abweicht.

Bei der Durcharbeitung der recht umfangreichen Leidener Sammlung war unser erstes Streben, zu prüfen ob sich, ähnlich wie etwa bei den Birmanen von Miss Tildesley, aus dem Anblick der Schädel eine Gruppierung des Materials ergäbe. Verschiedene Einteilungen sind versucht worden. Indessen ergaben sich stets so weit von der "Norm" abweichende Verteilungskurven (sie endeten meist brüsk an einer Seite), dass schliesslich davon abgesehen wurde und eine Unterteilung der Gesamtserie nach rein geographischen Gesichtspunkten vorgenommen wurde. Die meisten Schädel stammen aus Bantam und Batavia, diesen beiden wurde als dritte Abteilung Mittel-Java und als vierte Madura hinzugefügt. Von Ost-Java waren nur wenig Schädel vorhanden. Sie wurden mit denen ohne nähere Angabe zu einer Gruppe, "Ost und Varia," vereinigt. Das schien umsomehr

gerechtfertigt, als Swaving in Batavia wohnte und aller Wahrscheinlichkeit nach die Schädel, über die er nähere Angaben nicht erlangen konnte, zumeist von den entferntesten Stellen der Insel, m. a. W. aus Ost-Java stammten. Tabelle V gibt die Mittelwerte, Tabelle VI die C.R.L. zwischen den einzelnen Gruppen.

TABELLE V.

Mittelwerte von Serien von Java (männliche Schädel).

	Schmidt (40)	Bantam	Batavia	Mittel-Java	Ost u. Varia	Madura
L	173·1	169·5 (22)	170·2 (33)	172·0 (30)	174·6 (35)	172·2 (15)
B	142·6	139·5 (22)	141·7 (32)	142·2 (30)	142·2 (35)	143·1 (15)
H'	137·4	133·9 (22)	134·7 (33)	135·2 (30)	135·9 (32)	136·3 (15)
B'	93·4	89·9 (22)	91·4 (33)	92·3 (30)	94·0 (35)	91·5 (15)
LB	99·5	97·5 (22)	97·0 (32)	98·9 (30)	99·7 (35)	98·9 (15)
Q	320·6	312·2 (21)	315·0 (32)	317·8 (30)	—	—
βQ	—	310·5 (22)	314·0 (32)	316·2 (30)	317·5 (35)	319·9 (15)
Gl.U	504·5	491·3 (22)	497·2 (31)	503·4 (30)	503·4 (34)	504·5 (15)
S	365·0	353·4 (22)	353·2 (32)	357·3 (30)	363·1 (35)	361·7 (15)
G'H	70·5	68·8 (20)	70·4 (30)	70·7 (30)	70·9 (35)	69·8 (14)
J	132·7	130·7 (22)	133·0 (30)	134·8 (30)	134·7 (35)	134·5 (15)
NH'	—	49·1 (22)	49·5 (32)	50·7 (30)	50·5 (35)	51·8 (15)
NHRO.L	51·9	51·7 (22)	51·7 (32)	52·9 (30)	52·7 (35)	54·4 (14)
NB	25·9	25·9 (21)	26·5 (33)	26·9 (30)	26·7 (35)	26·8 (15)
O_1	—	42·4 (22)	42·9 (33)	43·0 (30)	43·5 (35)	42·2 (15)
Lacr. O_1	39·2	38·1 (17)	38·8 (29)	38·6 (26)	39·5 (28)	38·5 (15)
O_2	33·7	33·4 (22)	33·8 (33)	34·1 (30)	34·1 (35)	33·0 (15)
G_1	—	50·0 (21)	51·2 (30)	49·8 (30)	50·3 (35)	47·9 (12)
G_1'	47·5	46·1 (21)	46·6 (30)	45·8 (30)	46·4 (35)	44·7 (12)
G_2	41·5	39·9 (16)	40·6 (27)	40·5 (28)	41·2 (30)	41·8 (14)
fml	35·0	35·0 (22)	36·1 (33)	35·5 (30)	35·4 (35)	35·2 (14)
fmb	29·5	28·6 (22)	29·6 (33)	29·4 (30)	29·7 (35)	28·7 (15)
100 *B/L*	82·5	82·4 (22)	83·4 (32)	82·5 (30)	81·6 (35)	83·2 (15)
100 *H'/L*	79·5	79·1 (22)	79·2 (33)	78·3 (30)	77·9 (32)	79·1 (15)
100 *B/H'*	103·9	104·2 (22)	105·4 (32)	105·4 (30)	104·8 (32)	105·6 (15)
Oc. I.	—	66·1 (22)	66·2 (32)	64·9 (30)	65·8 (35)	65·8 (15)
100 *G'H/GB*	70·5	70·5 (19)	71·3 (30)	70·3 (30)	70·1 (35)	70·8 (14)
100 *NB/N'I*	50·2	50·5 (21)	51·3 (32)	51·2 (30)	50·9 (35)	49·3 (14)
100 *NB/NH'*	—	53·3 (21)	53·6 (32)	53·1 (30)	53·1 (35)	51·8 (15)
100 O_2/O_1	—	79·0 (22)	78·8 (33)	79·3 (30)	78·4 (35)	78·2 (15)
100 $G_2/$*Lacr.* O_1	86·1	86·9 (17)	87·5 (29)	89·2 (26)	86·2 (28)	85·8 (15)
100 G_2/G_1	—	79·5 (16)	80·3 (26)	81·3 (28)	82·5 (30)	88·4 (12)
100 G_2/G_1'	·5	85·9 (16)	87·5 (27)	88·5 (28)	89·3 (30)	94·6 (12)
100 *fmb/fml*	84·9	81·9 (22)	82·3 (33)	83·4 (30)	84·2 (35)	81·2 (14)
Pros. P ∠	—	81°·2 (19)	81°·1 (32)	82°·5 (30)	80°·6 (35)	83°·2 (13)
A ∠	69°·9	70°·6 (20)	68°·9 (30)	70°·1 (30)	70°·4 (35)	72°·0 (14)
N ∠	68°·6	67°·8 (20)	68°·4 (30)	67°·6 (30)	67°·6 (35)	65°·7 (14)
B ∠	41°·5	41°·6 (20)	42°·7 (30)	42°·2 (30)	42°·2 (35)	42°·3 (14)

Auf den ersten Blick wird man versucht sein, die Serien in zwei Gruppen einzuteilen: Bantam und Batavia einerseits, und den Rest in eine zweite Gruppe, vielleicht unter Auslassung der Maduraschädel, die einen etwas hohen Koeffizienten mit den Schädeln der Schmidt'schen Sammlung zeigen. Indessen ergeben sich dann Werte für die mittleren Abweichungen, die reichlich hoch erscheinen. Einige

TABELLE VI.

Koeffizienten der Rassenähnlichkeit zwischen Gruppen von Java Schädeln.

	Bantam (21·1)	Batavia (31·6)	Mittel-Java (29·9)	Ost u. Varia (34·3)	Schmidts Serie (40·0)	Madura (14·5)
Bantam (21·1) ursprüngliche	—	$-0{\cdot}02 \pm {\cdot}17^{*}$ (30)	$1{\cdot}30 \pm {\cdot}17^{\dagger}$ (30)	$2{\cdot}48 \pm {\cdot}17^{\ddagger}$ (30)	$2{\cdot}32 \pm {\cdot}18^{\S}$ (28)	$1{\cdot}83 \pm {\cdot}17^{\parallel}$ (30)
Bantam (21·1) reduzierte	—	*−0·08 ± ·67*	*5·25 ± ·69*	*9·49 ± ·65*	*8·45 ± ·66*	*10·65 ± ·99*
Batavia (31·6) ursprüngliche	$-0{\cdot}02 \pm {\cdot}17^{*}$ (30)	—	$0{\cdot}14 \pm {\cdot}17^{*}$ (30)	$1{\cdot}42 \pm {\cdot}17^{\P}$ (30)	$1{\cdot}55 \pm {\cdot}18^{**}$ (28)	$1{\cdot}24 \pm {\cdot}17^{\dagger\dagger}$ (30)
Batavia (31·6) reduzierte	*−0·08 ± ·67*	—	*0·45 ± ·55*	*4·32 ± ·52*	*4·41 ± ·51*	*6·24 ± ·86*
Mittel-Java (29·9) ursprüngliche	$1{\cdot}30 \pm {\cdot}17^{\dagger}$ (30)	$0{\cdot}14 \pm {\cdot}17^{*}$ (30)	—	$-0{\cdot}22 \pm {\cdot}17^{*}$ (30)	$0{\cdot}79 \pm {\cdot}18^{*}$ (28)	$0{\cdot}29 \pm {\cdot}17^{*}$ (30)
Mittel-Java (29·9) reduzierte	*5·25 ± ·69*	*0·45 ± ·55*	—	*−0·69 ± ·53*	*2·31 ± ·53*	*1·49 ± ·87*
Ost u. Varia (34·3) ursprüngliche	$2{\cdot}48 \pm {\cdot}17^{\ddagger}$ (30)	$1{\cdot}42 \pm {\cdot}17^{\P}$ (30)	$-0{\cdot}22 \pm {\cdot}17^{*}$ (30)	—	$0{\cdot}10 \pm {\cdot}18^{*}$ (27)	$0{\cdot}50 \pm .17^{*}$ (30)
Ost u. Varia (34·3) reduzierte	*9·49 ± ·65*	*4·32 ± ·52*	*−0·69 ± ·53*	—	*0·27 ± ·49*	*2·45 ± ·83*
Schmidts Serie (40·0) ursprüngliche	$2{\cdot}32 \pm {\cdot}18^{\S}$ (28)	$1{\cdot}55 \pm {\cdot}18^{**}$ (28)	$0{\cdot}79 \pm {\cdot}18^{*}$ (28)	$0{\cdot}10 \pm {\cdot}18^{*}$ (27)	—	$1{\cdot}14 \pm {\cdot}18^{\ddagger\ddagger}$ (27)
Schmidts Serie (40·0) reduzierte	*8·45 ± ·66*	*4·41 ± ·51*	*2·31 ± ·53*	*0·27 ± ·49*	—	*5·38 ± ·85*
Madura (14·5) ursprüngliche	$1{\cdot}83 \pm {\cdot}17^{\parallel}$ (30)	$1{\cdot}24 \pm {\cdot}17^{\dagger\dagger}$ (30)	$0{\cdot}29 \pm {\cdot}17^{*}$ (30)	$0{\cdot}50 \pm {\cdot}17^{*}$ (30)	$1{\cdot}14 \pm {\cdot}18^{\ddagger\ddagger}$ (27)	—
Madura (14·5) reduzierte	*10·65 ± ·99*	*6·24 ± ·86*	*1·49 ± ·87*	*2·45 ± ·83*	*5·38 ± ·85*	—

* Keine wesentliche Unterschiede: d.h. keine $\alpha > 10$.

† $\alpha > 10$: *J*, 10·22.

‡ $\alpha > 10$: *L*, 10·75, *B′*, 13·83, *Gl.U*, 10·32, *J*, 10·35.

§ $\alpha > 10$: *B′*, 10·59, *S*, 12·19, *Gl.U*, 13·06.

‖ $\alpha > 10$: *Gl.U*, 12·84, $100\frac{G_2}{G_1}$, 11·78.

¶ $\alpha > 10$: *L*, 10·06, *S*, 10·46.

** $\alpha > 10$: *S*, 15·80.

†† $\alpha > 10$: $100\frac{G_2}{G_1}$, 11·66.

‡‡ $\alpha > 10$: $100\frac{G_2}{G_1}$, 10·10.

von ihnen sind in der nächsten Tabelle VII mitgeteilt, zusammen mit den Werten für die lange ägyptische Serie, die von Pearson und Davin errechnet worden sind.

Selbst diese wenigen Stichproben zeigen, dass die Serien, mit denen wir es hier zu tun haben, nicht als homogen betrachtet werden können, bei beiden zeigen sich wesentliche Unterschiede gegenüber den ägyptischen Schädeln. Man kann daraus eine Stütze für die landläufige Ansicht, dass es sich in Java um eine Mischung einer brachycephalen und einer dolichocephalen Bevölkerung handelt, ablesen. Da unsere Kenntnisse über den Typ der dolichocephalen Schicht aber noch recht gering ist, und auf jeden Fall ausserhalb des Rahmens der vorliegenden Abhandlung liegt, sei hierauf nicht näher eingegangen. Wir begnügen uns einstweilen damit, die erste und zweite Gruppen, die negative Koeffizienten zeigen, zusammenzuwerfen, und werden unsere weiteren Vergleiche auf einer Gruppe aus Bantam-Batavia und einer zweiten aus Mittel- und Ost-Java aufbauen, wobei ausdrücklich im Auge zu behalten sein wird, dass es sich hierbei nur um eine vorläufige Gruppierung handelt*, deren Überprüfung späterhin notwendig sein wird.

TABELLE VII.

Mittlere Abweichungen einiger Masse.

	"E" Serie	Bantam u. Batavia	"Ost Java"*
L	5·72 ± ·09	6·56 ± ·42	8·42 ± ·39
B	4·76 ± ·08	5·45 ± ·35	4·84 ± ·23
H'	5·03 ± ·08	4·72 ± ·30	5·94 ± ·28
$100\,B/L$	2·68 ± ·06	4·25 ± ·28	4·40 ± ·20

* Mittel-Java, Ost und Varia und Schmidts Serie der Tabelle V.

Kurz besprochen werden muss noch die Frage der künstlichen Deformation. Angaben über das Vorkommen derartiger Gebräuche auf Java tauchen immer wieder einmal gelegentlich auf. Häufig kann es aber wohl in keinem Fall sein. Mehr als ein Einfluss von Lagerung des kindlichen Schädels auf harten Unterlagen wird von erfahrenen Beobachtern, wie Swaving, kaum ernstlich in Betracht gezogen. Was vielfach allerdings auffällt, ist der asymmetrische Bau des Schädels, der sich zumeist in einer Hervorwölbung der rechten oder linken Occipitalschuppe kundtut. Die Frage ist bereits 1866 von Halbertsma untersucht worden, der zu positiven Ergebnissen kam. Er hat an 125 Schädeln der Sammlung von J. v. d. Hoeven und Swaving gearbeitet, und viele Schädel der Leidener Sammlung tragen jetzt noch die Spuren dieses Untersuchers. Halbertsma mass zwei schiefe Durchmesser: (*a*) vom rechten Supraorbitalrand, da, wo ihn die Sutura maxillo-zygomatica schneidet, bis zum linken Tuber parietale und (*b*) umgekehrt. Es liegt nicht in

[* Ich finde gar keinen Grund in den in Tabelle VI gegebenen C.R.I. Werten für irgend eine Rassenunterscheidung. Die Werte sind kleinere als diejenigen von Serien aus benachbarten Begrabungen zu London. Eine Rassenunterscheidung, wenn sie überhaupt zu machen sei, muss auf etwas Anderes als diese C.R.I.'s beruhen. ED.]

unserer Absicht, hier die Frage der Schädelasymmetrie ausführlicher zu besprechen, erwähnt sei nur, dass wir für die Messungen von Halbertsma die folgenden Mittelwerte fanden:

	(*a*)	(*b*)
Schädel von Nichtirren (74)	162·7	161·8
Schädel von Irren (51)	160·5	159·5

Auf die Bestimmung der wahrscheinlichen Fehler ist verzichtet worden. Nimmt man aber, was mit Hinblick auf Tabelle VII kaum zu hoch gegriffen sein dürfte, die mittlere Abweichung als etwa gleich der von *L* an (etwa 5 mm.), so kann man sich leicht überzeugen, dass die Unterschiede zwischen (*a*) und (*b*) unwesentlich im statistischen Sinne sind.

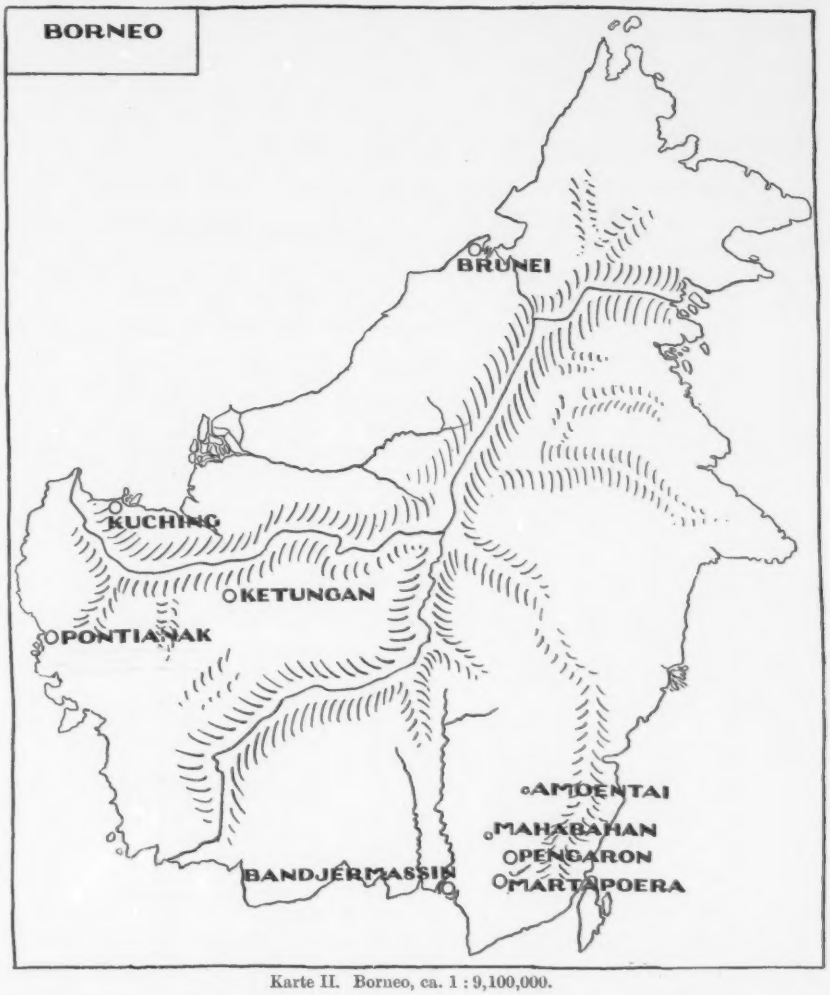
Man kann die Frage, ob typische Asymmetrien vorkommen, auch an den Typenkonturen zu prüfen versuchen. Die horizontalen Konturen zeigen nur wenig, die Ausbuchtung des Occipitale verschwindet selbst bei so kurzen Serien, wie die es sind, mit denen wir es hier zu tun haben, fast vollständig, wenigstens innerhalb der Grenzen der wahrscheinlichen Fehler. Auf der anderen Seite ist eine Verschiebung der Pfeilnaht nach links bei fast allen Transversalkonturen erkennbar.

Es ist ohne weiteres zuzugeben, dass man sich davor hüten muss, aus diesen—zudem hier nicht näher untersuchten—Verhältnissen weitreichende Schlüsse zu ziehen. Hingewiesen sei jedoch in diesem Zusammenhange auf Befunde, die Gans an Gehirnen von Javanern und Chinesen erheben konnte, und die ich später einmal an Chinesen bestätigen konnte, dass nämlich die hintere Zentralwindung häufig bei diesen Rassen eine den Europäern gegensinnige Asymmetrie zeigt. Wir verweisen im übrigen auf die Untersuchungen von Tildesley und von Hoadley, die ein reiches Material über Asymmetrien bringen*. Auch stark asymmetrische Schädel sind in die Serie, aus der die Mittelwerte berechnet wurden, aufgenommen worden.

5. *Dajaks.* Die Leidener Sammlung enthält 41 männliche Schädel von Dajaks aus Borneo, eine Anzahl, die eine Untersuchung dieses kraniologisch noch ungenügend bekannten Volkes aussichtreich erscheinen liess. Unsere bisherigen Kenntnisse gründen sich wesentlich auf die Berichte von Hose und McDougall und von Nieuwenhuizen. Die Bevölkerung Borneos teilt sich in zahlreiche Stämme auf, von denen sechs in Sarawak, dem Arbeitsgebiet der erstgenannten Autoren, wohnen. Haddon gelangt in einem anthropologischen Anhang zu dem Buch dieser Beobachter zu dem Schluss, dass sich unter ihnen wenigstens zwei Rassenelemente erkennen lassen, die wohl ungefähr den brachycephalen und dolichocephalen Elementen, die man beim Aufbau der javanischen Bevölkerung so häufig heranzieht, entsprechen dürften. Es ist hier nicht der Ort, Haddon's Vorstellung "einer dolichocephalen Rasse von heller Hautfarbe in Süd-Ost Asien," "die vielfach als kaukasisch," von ihm aber als indonesisch bezeichnet wird, einer Kritik zu unterziehen, aber seine Ergebnisse nötigen zu einer Prüfung der Frage, ob das vorliegende kraniologische Material als homogen betrachtet werden darf.

* Anmerkung bei der Korrektur. Inzwischen sind weiterhin die schönen Untersuchungen von T. L. Woo (*Biometrika*, Bd. XXIII, S. 324–352) erschienen, die das Vorhandensein von Asymetrieen klar beweisen.

Aus der Literatur liegt eine verhältnismässig kurze, aber zuverlässig durchgemessene Serie von Emil Schmidt vor, de Quatrefages und Hamy geben noch elf Schädel, weitere sind—meist recht unvollständig—von Virchow beschrieben



Karte II. Borneo, ca. 1 : 9,100,000.

worden, auch in den deutschen Katalogen finden sich noch weitere*. Von diesen ist nur die Schmidt'sche Serie hier berücksichtigt worden. Nicht mit einbezogen wurden die Schädel Nr. 881 und 882, da ihre Form stark von dem Typ der übrigen

* Göttingen, Nr. 266, 267; Berlin I, 204 (?), 217, 218; Bonn 355; Frankfurt a. M. 181; Darmstadt 18; Strassburg 298—303.

abwich. Das kommt besonders in dem Index $100\,B/L$, aber auch in den Indices $100\,H'/L$ und $100\,B/H'$ (die von Schmidt nicht gegeben sind) zum Ausdruck. Nr. 882 wird von Schmidt selbst als ein "im hohen Grade pathologisch deformierter Kopf" beschrieben. Man kann sich rein statistischer Überlegungen bedienen, um die Ausschliessung dieser beiden Schädel zu rechtfertigen: Der Index $100\,B/L$ von 882 beträgt 93·3, der nächsthöchste der Serie (875) beträgt 85·8. Der Unterschied beträgt m. a. W. $2{\cdot}8\sigma$ ($\sigma = 2{\cdot}68$, ägyptische Serie). Aus J. O. Irwin's Tabelle (*Biometrika*, Bd. XVII. S. 242) ergiebt sich aber, dass die Wahrscheinlichkeit $P_2(\lambda)$ dafür, dass ein derartiger Unterschied auf "Zufall" beruhe,

TABELLE VIII.

Mittelwerte von Dajak-Serien (männliche Schädel).

	Bandjermassin	"22"	Varia	Schmidt
L	175·0 (16)	175·1 (7)	176·6 (18)	178·9 (14)
B	140·3 (16)	135·2 (7)	136·2 (17)	140·0 (13)
H'	132·9 (15)	136·0 (7)	135·6 (14)	135·8 (13)
F	92·6 (16)	93·6 (7)	93·5 (18)	93·6 (13)
LB	98·6 (15)	101·2 (7)	99·3 (14)	99·5 (13)
S	361·6 (15)	361·4 (7)	366·4 (14)	370·7 (10)
Gl. U	504·8 (16)	500·9 (7)	505·6 (18)	510·0 (13)
Q	313·1 (16)	310·3 (7)	311·6 (17)	315·5 (13)
βQ	309·8 (16)	307·0 (7)	309·5 (15)	—
fml	36·1 (15)	36·5 (7)	35·3 (13)	36·8 (10)
fmb	30·4 (15)	30·1 (7)	29·1 (13)	31·0 (11)
G'H	69·3 (13)	69·6 (7)	70·3 (14)	69·2 (11)
J	133·6 (16)	130·6 (7)	132·3 (17)	134·3 (12)
GB	100·5 (16)	99·7 (7)	102·3 (17)	99·6 (12)
NHR	53·9 (15)	51·5 (7)	53·0 (16)	51·3 (10)
NH'	51·3 (16)	48·8 (7)	49·6 (16)	—
NB	28·2 (16)	26·6 (7)	26·7 (18)	26·6 (9)
O_1	42·3 (16)	42·9 (7)	42·6 (18)	—
Lacr. O_1	38·1 (14)	39·3 (7)	38·2 (14)	39·2 (9)
O_2	33·5 (16)	34·1 (7)	33·7 (18)	32·7 (10)
G_1	50·5 (11)	48·6 (7)	49·2 (11)	—
G_1'	46·5 (11)	45·0 (7)	44·8 (11)	46·0 (8)
G_2	40·3 (10)	40·5 (7)	40·4 (11)	41·4 (8)
GL	96·6 (12)	95·7 (7)	94·1 (11)	96·0 (12)
$100\,B/L$	80·2 (16)	77·2 (7)	77·2 (17)	78·4 (13)
$100\,H'/L$	75·8 (15)	77·6 (7)	77·0 (14)	76·1 (13)
$100\,B/H'$	106·1 (15)	99·5 (7)	100·7 (14)	103·2 (13)
Oc. I.	64·0 (15)	63·3 (7)	62·1 (14)	—
$100\,G'H/GB$	68·4 (13)	69·8 (7)	69·8 (14)	69·8 (11)
$100\,NB/NHR$	51·1 (15)	51·7 (7)	50·3 (16)	52·2 (9)
$100\,NB/NH'$	55·0 (16)	54·6 (7)	54·0 (16)	—
$100\,O_2/O_1$	79·4 (16)	79·5 (7)	79·3 (18)	—
$100\,O_2/Lacr.\,O_1$	88·5 (14)	86·9 (7)	86·7 (14)	84·3 (9)
$100\,G_2/G_1$	79·7 (10)	82·0 (7)	82·6 (10)	—
$100\,G_2/G_1'$	86·6 (10)	90·2 (7)	90·7 (10)	90·7 (7)
$100\,fmb/fml$	84·5 (15)	82·7 (7)	82·9 (13)	84·5 (10)
Pros. $P\,\angle$	82°·4 (11)	82°·7 (7)	83°·0 (13)	—
$A\,\angle$	72°·0 (12)	73°·7 (7)	71°·8 (11)	72°·0 (11)
$N\,\angle$	66°·7 (12)	64°·7 (7)	65°·2 (11)	66°·6 (11)
$B\,\angle$	41°·3 (12)	41°·6 (7)	43°·0 (11)	41°·4 (11)

< 0·01 ist. Die beiden letzten Schädel der Schmidt'schen Sammlung sind dagegen, trotz der Bedenken des Autors, mit in die Berechnungen eingeschlossen worden.

Aus der Leidener Sammlung sind nur die männlichen Schädel gemessen worden, einige weibliche sind zurückgestellt worden. Wie bei den Javanern auch, liess sich keine Gruppeneinteilung nach dem Aussehen der Schädel vornehmen, und es blieb auch hier nur übrig, nach geographischen Gesichtspunkten einzuteilen. Sechzehn Schädel kamen von Bandjermassin und bildeten eine Gruppe. Sieben Schädel, die mit 22*a*, *b*, u.s.w. bezeichnet waren und offensichtlich zur gleichen Zeit der Leidener Sammlung gesandt waren, wurden in eine zweite Gruppe verwiesen, und die übrigbleibenden als dritte Gruppe hinzugenommen.

Die Mittelwerte dieser Gruppen und der Schmidt'schen Serie sind in Tabelle VIII auf S. 70 gegeben. Die Koeffizienten der Rassenähnlichkeit enthält die nächste Tabelle IX. Die Berechtigung, sie als von einheitlicher Abkunft anzusehen, ergibt sich trotz der Kürze der einzelnen Serien wohl ohne weiteres. Die Haupttabelle gibt dann die Mittelwerte der Gesamtserie.

TABELLE IX.

Ursprüngliche Koeffizienten der Rassenähnlichkeit zwischen Gruppen von Dajaks.

	Bandjermassin	"22"	Varia	Schmidt
Bandjermassin (14·4)	— —	0·54 ± ·17 (30)* 0·95 ± ·28 (12)†	0·81 ± ·17 (30) 1·44 ± ·28 (12)	0·42 ± ·18 (28) 0·34 ± ·30 (10)
"22" (7·0)	0·54 ± ·17 (30)* 0·95 ± ·28 (12)†	— —	−0·67 ± ·17 (30) −0·77 ± ·28 (12)	0·05 ± ·18 (28) −0·06 ± ·30 (10)
Varia (14·8)	0·81 ± ·17 (30) 1·44 ± ·28 (12)	−0·67 ± ·17 (30) −0·77 ± ·28 (12)	— —	0·23 ± ·18 (28) −0·15 ± ·30 (10)
Schmidt (11·0)	0·42 ± ·18 (28) 0·34 ± ·30 (10)	0·05 ± ·18 (28) −0·06 ± ·30 (10)	0·23 ± ·18 (28) −0·15 ± ·30 (10)	— —

* Alle Charaktere. † Indices und Winkel.

Schon eine flüchtige Übersicht zeigt, dass wir es hier mit einer von den Javanern durchaus verschiedenen Bevölkerung zu tun haben, und es fällt auch leicht, schon nach dem Aussehen die beiden Gruppen zu trennen. Der Schädel der Dajaks ist länger und schmäler als der der Javaner, wenn auch ungefähr von der gleichen Höhe. Das Hinterhaupt der Dajaks ist besser gewölbt, was auch in den Werten des Occipitalindex zum Ausdruck kommt. Das Gesichtsskelett beider Rassen ist allerdings recht ähnlich, und das mag es erklären, dass die Dajaks so häufig zu den Malayen gerechnet worden sind.

Über künstliche Deformation des Schädels bei den Malanaus von Sarawak wird von Hose und McDougall berichtet. Dieser Brauch soll aber in erster Linie bei weiblichen Kindern ausgeübt werden, um den Töchtern ein dort hoch im Preis stehendes "Mondgesicht" zu sichern. Der von den genannten Autoren abgebildete Apparat übt einen fronto-occipitalen Druck aus. Unter den hier allein betrachteten männlichen Schädeln dürfte kein künstlich deformiertes Exemplar vorhanden sein, dem Aussehen nach liessen sich jedenfalls keine Spuren einer derartigen Einwirkung feststellen.

6. *Philippinen.* Von den Philippinen ist ein reichhaltiges Material, das s. Z. von Schadenberg gesammelt und von Koeze veröffentlicht worden war, bekannt. Auf die *Crania Ethnica Philippinica* des letztgenannten Autors sei bezüglich

TABELLE X.

Mittelwerte von Koezes Philippinen Schädeln (männliche).

	Tagalen	Tagbanuas	Visayas	Igoroten	Ilocanos	Negritos (Aëtas)
C	1458·7 (27)	1444·4 (8)	1464·5 (10)	1459·5 (4)	1492·0 (9)	1415·6 (34)
L	179·0 (36)	182·4 (8)	178·8 (14)	174·3 (6)	172·0 (9)	172·4 (38)
B	138·9 (36)	135·9 (8)	143·5 (14)	140·5 (6)	143·8 (9)	143·9 (37)
H	138·9 (33)	138·3 (8)	139·4 (13)	134·3 (6)	134·8 (9)	137·2 (36)
LB	101·5 (34)	102·2 (8)	102·6 (13)	99·0 (6)	96·1 (9)	99·6 (36)
B'	93·1 (36)	95·7 (8)	94·7 (15)	90·5 (6)	92·8 (9)	92·3 (38)
Gl. U	505·2 (37)	508·4 (8)	513·9 (13)	502·0 (6)	500·7 (9)	495·2 (37)
S	374·1 (35)	374·5 (8)	373·5 (12)	362·7 (6)	368·8 (9)	360·4 (36)
J	131·8 (26)	130·3 (7)	134·6 (9)	131·9 (6)	132·6 (9)	131·8 (34)
NH (?)	50·7 (30)	50·0 (7)	51·7 (10)	50·8 (6)	49·6 (9)	51·0 (36)
NB	27·6 (30)	27·3 (7)	26·9 (11)	25·1 (6)	26·8 (9)	27·1 (36)
O_2	36·6 (33)	34·8 (8)	35·8 (14)	35·1 (6)	34·9 (9)	35·3 (37)
G_1	51·8 (27)	51·4 (5)	51·7 (10)	51·5 (4)	53·0 (7)	48·8 (33)
PL	80°·5 (22)	81°·2 (6)	81°·2 (8)	83°·1 (6)	80°·8 (6)	81°·9 (29)
100 *B*/*L*	77·6 (36)	74·6 (8)	80·2 (14)	80·6 (6)	83·6 (9)	83·6 (37)
100 *H*/*L*	77·6 (33)	76·1 (8)	77·2 (11)	75·6 (6)	78·5 (9)	79·4 (36)
100 *H*/*B*	100·1 (32)	101·9 (8)	97·6 (11)	95·2 (6)	93·8 (9)	95·3 (36)
100 *NB*/*NH* (?)	54·5 (30)	54·8 (7)	51·9 (10)	49·8 (6)	54·0 (9)	53·0 (36)
100 G_2/G_1	78·7 (27)	80·1 (5)	73·6 (10)	75·2 (4)	56·0 (7)	77·2 (32)

Katalogisierung und Abbildung verwiesen. Die Sammlung Schadenberg enthält Schädel von verschiedenen Stämmen, von denen zunächst festzustellen war, wie weit sie einheitlicher Natur waren. Einige Serien sind allerdings so kurz, dass sich kaum gesicherte Schlussfolgerungen daraus ziehen lassen. Wir haben uns daher mit diesen nicht beschäftigt. Aus Koezes Tabellen, die leider sehr unübersichtlich angeordnet sind (männliche und weibliche Schädel stehen wild durcheinander), wurden s. Z. ohne Kenntnis von Sullivans Zusammenstellung der Negritos die in Tabelle X enthaltenen Mittelwerte berechnet. Die von Koeze gegebenen Indices stimmen recht oft nicht mit den Massen, aus denen sie angeblich berechnet worden sind, überein, sie sind sämmtlich nachkontrolliert und wo nötig

verbessert worden, wobei allerdings von der optimistischen Annahme ausgegangen worden ist, dass die Reihen dieser Masse keine Druckfehler enthalten!

Die sich ergebenden Koeffizienten der Rassenähnlichkeit gibt Tabelle XI. Man sieht jedenfalls das eine, dass es sich um inhomogenes Material handelt, dass es also nicht angeht, die einzelnen Stämme ohne weiteres zu grösseren Gruppen zusammenzulegen. So schien es am sichersten, mit "Negritos" und Tagalen, den beiden einzigen Serien, die von einigermassen ausreichender Länge sind, zu arbeiten. Während ein Vergleich der verschiedenen, von Koeze selbst gemessenen

TABELLE XI.

Koeffizienten der Rassenähnlichkeit zwischen Philippinen Schädeln (s. Tabelle X) (basiert auf 19 Charaktere, wahrscheinlicher Fehler = ± ·21).*

	Tagalen	Tagbanuas	Visayas	Igoroten	Ilocanos	Negritos (Aëtas)
Tagalen (31·6)	—	0·48	1·21	1·90	4·44	11·41
Tagbanuas (7·4)	0·48	—	2·00	1·90	5·49	7·70
Visayas (11·7)	1·21	2·00	—	0·77	1·72	3·44
Igoroten (5·7)	1·90	1·90	0·77	—	0·34	0·85
Ilocanos (8·6)	4·44	5·49	1·72	0·34	—	0·65
Negritos (Aëtas) (35·5)	11·41	7·70	3·44	0·85	0·65	—

* Anm. Wir sind uns vollständig im Klaren darüber, dass die meisten der von Koeze gemessenen Serien viel zu kurz sind, um überhaupt die Anwendung des C.R.L. zu gestatten. Alles, was in der obigen Tabelle gezeigt werden soll, ist, dass die Berechtigung, mehrere der auf den Philippinen wohnenden Rassen als einheitlich zu betrachten, nach den bisher vorliegenden Messungen jedenfalls nicht eingeräumt werden kann. (Etwa "Negritos" und "Nicht-Negritos" gegenüberzustellen!)

Serien ohne weiteres möglich ist, ergab sich jetzt die Frage, ob die von diesem Autor gegebenen Masse, deren Definition (S. 2—3 der *Crania Ethnica*) nicht durchweg genügend erschien, einen Vergleich mit anderen erlaubten. Um nur einige Beispiele zu nennen, misst Koeze den Frontalumfang "von der einen Gehöröffnung zur anderen," ohne zu sagen, ob das Massband über Bregma oder Apex gelegt wird und ohne seinen Messpunkt, die "Gehöröffnung" näher zu definieren. Er misst die "kleinste Länge des Obergesichtes" vom Nasion bis zum "Oberen Alveolarpunkt," welch letzteres vermutlich mit Martins Prosthion, übereinstimmt. Die Nasenlänge wird vom Nasion bis zum "unteren Nasenstachel

oder der tiefsten Stelle der Apertura piriformis" gemessen, was eine Bestimmung, ob *NH'* oder *NHR* oder *NHL* gemeint ist, nicht erlaubt. Die Länge der Orbita (gemeint ist das, was gewöhnlich Breite genannt wird) wird vom "Vorderrand des Ductus nasolacrymalis" aus gemessen, was wahrscheinlich O_1 entspricht, aber auch O_1' sein könnte. Nähere Angaben darüber, ob der Profilwinkel zum Prosthion oder Alveolarpunkt hin abgenommen ist, fehlen. Koeze gibt ferner an, die Länge der Schädelbasis gemessen zu haben (Hirnschädel Nr. 5), definiert aber dann als Länge des Profils (Gesichtsschädel Nr. 7) den "Abstand vom Nasion zum Vorderrand des For. Magnum." Offensichtlich liegt hier ein Versehen vor, das aber immerhin stutzig macht. Bei dieser Sachlage schien es das beste, die Schädel selbst noch einmal durchzumessen. Herrn Prof. Juinbol habe ich meinen Dank dafür ausgesprochen, ich wiederhole ihn gerne an dieser Stelle nochmals.

Der Entschluss, die Philippinen mit in den Kreis der Betrachtungen einzubeziehen, nötigt dazu auf das Problem der "Negritorasse" einzugehen. Eine Übersicht über die geschichtliche Entwicklung und den verworrenen Stand dieses Begriffes hat erst kürzlich v. Eickstedt gegeben, und wir können uns darauf stützen. Das Wort "Negritos" wurde ursprünglich für gewisse Stämme im Inneren der Philippinen verwandt; ist aber später in einem weiteren Sinne gebraucht für einen primitiven Zweig der Menschheit, dessen Reste heutzutage in einzelnen abgeschlossenen Gebieten Süd-Ostasiens verstreut sein sollen. Um jedes Missverständnis zu vermeiden, sollen daher die von Schadenberg und Koeze als "Negritos" aufgeführten Schädel hier im Folgenden als "Aëtas" bezeichnet werden. Es wird sich zeigen, dass man über die Stellung dieser Aëtas auf Grund des C.R.L. zu Schlussfolgerungen kommt, die recht verschieden von den geläufigen Anschauungen sind. Da liegt es nahe einzuwerfen, dass die Sammlung Schadenberg keine echten Aëtaschädel hat. Es verlohnt sich daher wohl, mit einigen Worten auf die sonst in der Literatur vorhandenen Angaben über die Kraniologie der Aëtas einzugehen.

De Quatrefages und Hamy geben Masse von fünf Schädeln. Zwei von diesen, die als "Zamar" bezeichnet sind, sollen aber nach Flower von Igoroten stammen. Virchow hat zahlreiche Aëtaschädel in der Hand gehabt, die ihm teils von Jagor, teils von A. B. Meyer gesandt worden waren. Beide haben ausgedehnte Reisen in den Philippinen unternommen. Jagors Reisebericht hat Virchow einen kraniologischen Anhang zugefügt, der aber keine Messungen enthält. Virchow hat dann noch weitere Schädel von G. A. Baer erhalten und von diesen auch einige Masse veröffentlicht. G. A. Baer wohnte in den Philippinen; über seinen Beruf liess sich nichts näheres in Erfahrung bringen. Virchow hat einen Brief von Baer drucken lassen, aus dem hervorgeht, dass alles in allem 31 Aëtaschädel von den Philippinen nach Berlin gelangten. Eine eingehende Bearbeitung dieser wertvollen Sammlung scheint nie unternommen worden sein!

Von Virchow ist die auch sonst öfters aufgeworfene Frage der künstlichen Deformierung dahin beantwortet worden, dass unter den sechs (von A. B. Meyer) gesandten Schädeln nur einer vorhanden war, welcher "den vollen Eindruck eines

ausgebildeten, regelmässig gewachsenen Schädels macht"—angeblich war das der einzige männliche Schädel.

Masse eines Aëtas sind von Cabeza mitgeteilt worden, und zwei weitere Schädel aus Madrid sind kurz von Bauer beschrieben worden. Bauer gibt ausdrücklich an, dass er die Masse von nur zwei Schädeln gibt "weil sie den Typ der Rasse ganz scharf wiedergeben." Schadenberg selbst gibt Masse von sieben Schädeln an, die aber vielleicht ein Teil des Materials ausmachen, das sich jetzt im Ethnographischen Museum zu Leiden befindet. Tabelle XII gibt die spärlichen Zahlen, die sich so aus der Literatur zusammentragen lassen. De Quatrefagess Schädel sind länger, Cabezas Schädel kürzer als der von uns gefundene Durchschnitt. Bringt man die

TABELLE XII.

Männliche Aëtas anderer Autoren.

	DeQuatrefages & Hamy (3)	Virchow	Cabeza (1)	Bauer (2)
C	1455	1275 (2)	1120	—
L	176·3	—	160	183·5
B	141·3	—	120	142
B'	90·7	—	90	115
H'	132·3	—	131	153 (*H*)
U	505	500 (1)	466	—
∢	365·7	—	—	—
LB	96·3	—	—	—
fml	34·3	—	30	—
fmb	29 (2)	—	23·6	—
J	133	135 (1)	114	142·5
GB	99 (2)	—	—	—
O_2	34·8 (2)	—	32	(?) 36·5
NB	27 (2)	—	26	27
NH'	51·5 (2)	46 (?)	43	(?) 56·5
G_2	37·8 (2)	—	—	—
G'H	—	—	60	72·5

vier Schädel zusammen, so dürften sich Mittelwerte ergeben, die wohl nicht wesentlich von denen der Sammlung Schadenberg abweichen. Auffallend sind die von Bauer mitgeteilten Masse. Es ist kaum glaubhaft, dass die Schädel, die ihm vorgelegen haben und die er für typisch ansah, derselben Bevölkerung entstammen sollen wie die der anderen Autoren. Alles in allem gewinnt man den Eindruck, dass die Leidener Aëtaschädel für durchaus typisch gehalten werden dürfen, was ja auch, mit Rücksicht auf die Persönlichkeit des Sammlers, von vorn herein anzunehmen war. Der von Bauer flüchtig umrissene Typ dürfte abzulehnen sein. In allen europäischen Museen zusammen ruhen sicherlich weit über 50 Schädel von Aëtas, eine Anzahl, die wohl erlaube, unsere Kenntnis dieses Volksstammes auf eine sicherere Grundlage zu stellen. Hier sind nur die im Ethnographischen Museum zu Leiden ruhenden Schädel der Sammlung Schadenberg zur Bildung der Mittelwerte verwandt worden.

7. *Andamanesen.* Schon allein, um das Problem der Negritorasse in einigermassen befriedigender Weise behandeln zu können, schien es wünschenswert

Karte III. Uebersichtsskizze von Ostasien, ca. 1: 45,600,000.

einwandfreie Messungen von den Andamanesen zur Verfügung zu haben. Die Überlegung dass dieser Volksstamm, von auffallend kleiner Statur, in dem Pygmäenproblem eine Rolle spielt, konnte den einmal gefassten Vorsatz nur unterstützen.

Wir verdanken Dobson und Man gute Schilderungen der Andamanesen. Nach diesen Autoren sind die Inseln von sieben verschiedenen, aber einer einheitlichen Rasse angehörigen Stämmen bewohnt. Kraniologische Untersuchungen liegen von Virchow, Turner, Flower, Gupte und Sullivan vor.

Die jetzt im Royal College of Surgeons zu London befindlichen Schädel wurden von mir erneut gemessen, um von ihnen alle die Masse zu haben, die dank den Bemühungen der biometrischen Schule jetzt bereits von so zahlreichen Serien veröffentlicht sind. Den Schädeln des College of Surgeons konnten noch einige aus dem British Museum hinzugefügt werden, ferner wurde mir die Liste einiger Schädel von Oxford durch Mr Dudley Buxton zur Verfügung gestellt. Sir Arthur Keith und Miss Tildesley, Mr Pycraft und Mr Dudley Buxton meinen Dank zu wiederholen, ist mir wiederum angenehme Pflicht. Abweichend von den sonst hier befolgten Principien, sind zu diesen Schädeln, die ein immer noch spärliches Material darstellten, eine Reihe von Messungen aus der Literatur hinzugenommen worden. Sir William Turner hat drei, Gupte vier, und Sullivan noch zwei weitere erwachsene männliche Schädel mitgeteilt. Gupte gibt an, der Messtechnik Turners gefolgt zu sein. Turner selbst beschreibt die von ihm befolgte Technik in seinem anthropologischen Beitrag zu dem Bericht der Challenger Expedition. Er giebt an, der Technik Brocas gefolgt zu haben, und verweist neben Brocas Buch auf Topinards *Anthropologie* und Flowers *Catalogue of the College of Surgeons' Museum* (*Homo*). Die Definition der meisten Masse ist ohne weiteres klar: *L, B, H', GL.U, S, S_1, S_2, S_3, LB, GL, G'H, J, NH', NB,* und O_2 sind glatt anzunehmen. Schwierigkeiten bereitet, wie so oft, die Breite der Orbita. "The nasal and orbital measurements.....have been taken according to the methods of M. Broca, and the classifications employed by Broca and by Flower have been adopted." Topinard (S. 257) definiert den horizontalen Durchmesser der Orbita "from the Dacryon," "the point where the posterior border of the ascending process (of the maxillary bone) joins the frontal and the os unguis" (S. 55). Flower (S. xx) nimmt als inneren Ausgangspunkt "the spot where the ridge which forms the posterior boundary of the lacrymal groove meets the fronto-lacrymal suture." Er fügt ausdrücklich hinzu, dass dieser Punkt *hinter* (behind) Brocas Dacryon liegt. Bei dieser Sachlage schien es am sichersten, Turners Mass der Orbitalbreite bei der Bildung der Durchschnittswerte nicht mit einzubeziehen. In Guptes Tafeln findet sich, wie eine Nachprüfung an der Hand der Indices ergab, ein Druckfehler: der Wert von *B*, bei S. 34 muss 133 statt 113 mm. sein. Von Sullivan ist verwandt worden *L, B, H', OH, B', LB, J, NB, O_1R, O_1L, O_2R, O_2L, G_2, fml, fmb, U, S, Q', Prosth. P∠*. Die Profilwinkel, *GL* und *G'H*, sind zum Prosthion gemessen worden, bei der Nasenhöhe und Gaumenlänge blieb es unklar, in welcher Weise gemessen worden war. Die in Flowers Arbeit noch enthaltenen Schädel aus dem Middlesex Hospital, von Mr Bull und von Dr Thomson sind nicht hinzugenommen, da es ebenso wie bei den beiden Schädeln des British Museum nicht sicher schien, ob sie nicht etwa bereits unter der Zahl der inzwischen angewachsenen Sammlung des R.C.S. enthalten waren. Ein von Virchow mitgeteilter Schädel hat "offenbar einer älteren Frau angehört." Ausser den in den Tabellen des Anhanges gegebenen

Schädel sind also zur Bildung der Mittelwerte verwandt, 3 von Sir William Turner, 4 von Gupte und 2 von Sullivan gemessene Schädel.

Auf eine Beschreibung der Zeichen von Verehrung der Schädel, wie Schmuck, Bemalung und Ornamentierung soll hier nicht eingegangen werden; die meisten Andamanenschädel tragen Spuren davon. Eine eingehendere Beschreibung der Schädel erübrigt sich im Hinblick auf die bereits in der Literatur vorhandenen Angaben.

Nur ein Punkt sei kurz gestreift: schon bei flüchtigem Anblick fällt es auf, dass die Schädel der Andamanesen nicht nur absolut klein sind, sondern dass sie auch einen gewissermassen kindlichen Eindruck machen, bedingt durch ein selbst im Verhältnis zu der kleinen Hirnkapsel kleines Gesicht. Es ist nicht ohne Interesse, die Schädel der Aëtas in dieser Hinsicht mit denen der Andamanesen zu vergleichen.

Nach Morants Vorgang wird aus dem Flächeninhalt des Gesichtsdreiecks A und dem Quadrat des Sagittalbogens S ein Index geformt. Die nachfolgende Tabelle XIII enthält die Werte für die beiden hier betrachteten Rassen, zusammen mit den von Morant für verschiedene moderne Rassen gegebenen Werten. Man sieht sofort, dass sich Aëtas und Andamanesen in diesem grundlegenden Punkt recht deutlich von einander unterscheiden, wenn auch zugegeben werden muss, dass angesichts unserer Unkenntnis der mittleren Abweichung des hier betrachteten Index keine allzu sicheren Aussagen gemacht werden können.

TABELLE XIII.

	A	S	$100\,A/S^2$
Andamanesen ♂ ...	2657·6 (31)	349·0 (27)	2·18
Aëtas ♂	3126·1 (26)	360·0 (31)	2·41
50 moderne Rassen (n. Morant, ♂ Durchschnittswerte)	2788—3559	360·4—386·9	2·11—2·62

8. *Vergleichsmaterial aus der Literatur.* A. *Chinesen.* Masse chinesischer Schädel waren zuerst von Tildesley aus der Literatur gesammelt und mit den Birmaschädeln verglichen worden. Diese Werte wurden dann zunächst von Morant übernommen, später aber, nachdem noch weiteres Material hinzugekommen war, in Gruppen zerlegt. Es ergab sich eine recht weitgehende Ähnlichkeit zwischen Nord- und Südchinesen, von denen aber eine von Koganei mitgeteilte Serie aus dem Norden stark abwich. Nach Morants Veröffentlichung sind zwei neue Serien aus China erschienen, die schon von vornherein, weil beide, von erfahrenen Beobachtern stammend, nach genauen Definitionen durchgemessen sind, Vertrauen verdienen.

Gordon Harrower hat 1920 über Südchinesen aus Fukien (von ihm Hokien genannt*) berichtet, und nordchinesische Schädel sind 1928 von Davidson Black aus Peking beschrieben worden. Harrowers Reihe stammt von ausgewanderten Arbeitern, die in Singapore verstorben waren, Davidson Blacks Serie umfasst Einwohner aus Chihli, Shansi und Shantung, ferner aus dem nördlichen Honan und aus der Provinz Fengtien der Mandschurei. Die letzteren dürften, so möchte ich glauben, teilweise Einwanderer aus dem dichtbevölkerten Shantung gewesen sein.

Bei der Verwendung der von Harrower und von Davidson Black gemessenen Serien ist wieder auf die Definition ihrer Masse zu achten. Die von Harrower angewandten Masse ergeben sich am bequemsten aus der von ihm bei anderer Gelegenheit veröffentlichten Liste (*Biometrika*, Bd. XX^B, S. 251) zu der nur zu erwähnen ist, dass sein Q dem hier als Q' bezeichneten Masse entspricht und dass die von ihm gemessene Nasenhöhe als NH' angenommen worden ist, trotz der beruhigenden Tabelle auf Seite 247 der genannten Arbeit!

Zur Berechnung des C.R.L. sind folgende Masse von Davidson Black (mit seinen Nummern in Klammern) verwandt worden: L (1), B (2), B' (3), H' (8), LB (9), *fml* (12), *fmb* (13), U (50), S (51), Q' (55), J (4), $G'H$ (15), NHL (16), NB (17), O_1R (56), O_2R (58), G_1' (27) oder G_1 (27*a*), G_2 (28), *Prosth.* $P\angle$ (11).

Der Index B/H' wurde als der umgekehrte Wert des von Davidson Black gegebenen Index (R_4) H'/B gefunden. Ausser den hier genannten enthält Davidson Blacks Zusammenstellung noch eine Reihe von anderen Massen, die in die Tabelle der Mittelwerte aufgenommen worden sind. Davidson Black hat den Profilwinkel als den Winkel zwischen Frankfurter Horizontalen und der Verbindungslinie von Nasion und Prosthion in der Median-Sagittal Ebene definiert und am Kraniogram gemessen. Wir glauben, dass dieser Winkel dem *Prosth.* $P\angle$ eher entspricht, als dem *Alv.* $P\angle$, den Morant übrigens (*Biometrika*, Bd. XX^B, S. 364) nicht mit Martins Mass 72 vergleichen zu dürfen glaubt.

Der Unterschied zwischen dem Alveolaren und dem Prosthion Profilwinkel beträgt bei den hier betrachteten Rassen zwei Grad oder mehr, m. a. W. über 50 % ihrer mittleren Abweichungen! (3°·24.)

Die beiden Winkel für "practically equivalent" zu halten, wie es Davidson Black tut, birgt angesichts dieser Zahlen wohl doch die Gefahr von Fehlschlüssen in sich! Die Winkel des Gesichtsdreiecks sind von Davidson Black aus den Strecken $G'H$ = Nasion-Alveolarpunkt, GL' = Basion-Prosthion und LB = Nasion-Basion bestimmt worden. Wir haben uns nicht entschliessen können, die so gefundenen Winkel mit den aus dem Dreieck Nasion-Basion-Alveolarpunkt bestimmten bei den Berechnungen des C.R.L. als gleichwertig anzusehen.

* In der Schreibung chinesischer Namen folge ich der offiziell von der chinesischen Postverwaltung und anderen Behörden angenommenen. Die willkürliche Umschreibung chinesischer Laute, namentlich in der deutschen und französischen Literatur, ist oft verwirrend. Auch Harrower folgt vielfach örtlichen Dialekten.

Es ist zunächst zu prüfen, wie weit die durch die Arbeiten dieser beiden Autoren bekannt gewordenen Schädelserien mit den von Morant gesammelten übereinstimmen. Tabelle XIV gibt die C.R.L.'s zwischen den vier Serien. Man kann sich kaum des Verdachtes erwehren, dass die Autoren, auf die sich Morant bei der Zusammenstellung der Nordchinesen gestüzt hat, tatsächlich nicht diese, sondern Südchinesen vor sich gehabt haben.

TABELLE XIV.

Koeffizienten der Rassenähnlichkeit zwischen chinesischen Serien.

	Chinesen : Peking (78·7)	Chinesen : Fukien (36·0)	"Northern Chinese" (34·8)	"Southern Chinese" (62·6)
Chinesen : Peking (78·7)	—	2·60 ± ·20 (23)* 2·73 ± ·36 (7)† 5·16 ± ·39‡	3·21 ± ·18 (27) 5·20 ± ·32 (9) 6·32 ± ·36	7·82 ± ·19 (25) 7·81 ± ·34 (8) 10·88 ± ·27
Chinesen : Fukien (36·0)	2·60 ± ·20 (23)* 2·73 ± ·36 (7)† 5·16 ± ·39‡	—	1·62 ± ·17 (31) 2·10 ± ·28 (12) 4·58 ± ·48	1·76 ± ·18 (27) 1·24 ± ·30 (10) 3·85 ± ·40
"Northern Chinese" (34·8)	3·21 ± ·18 (27) 5·20 ± ·32 (9) 6·32 ± ·36	1·62 ± ·17 (31) 2·10 ± ·28 (12) 4·58 ± ·48	—	0·59 ± ·19 (25) 1·00 ± ·36 (7) 1·32 ± ·43
"Southern Chinese" (62·6)	7·82 ± ·19 (25) 7·81 ± ·34 (8) 10·88 ± ·27	1·76 ± ·18 (27) 1·24 ± ·30 (10) 3·85 ± ·40	0·59 ± ·19 (25) 1·00 ± ·36 (7) 1·32 ± ·43	—

* Alle Charaktere. † Indices und Winkel. ‡ Reduziert.

Haberer, dessen Arbeit aus dem Jahr 1902 (nicht 1892!) stammt, hat acht Boxerschädel, also aller Wahrscheinlichkeit nach solche von Leuten aus Shantung, und 29 Schädel aus Gräbern der Umgebung von Chan Chung-Sse beschrieben. Ich kann mich aus meiner Pekinger Zeit keines Tempels (um einen solchen handelt es sich) dieses Namens entsinnen. Aus der Silbe "Sse" geht aber hervor, dass es sich jedenfalls um einen buddhistischen Tempel handelt, und man trifft in diesen Tempeln in der Tat oft Mönche aus weitentfernten Gegenden Chinas wie ich während meiner Reisen im Inneren Chinas öfters feststellen konnte. Dieser Teil von Haberers Sammlung kann also in der Tat nicht als eine Probe zur Kraniologie Nordchinas angesehen werden. Die sechs Schädel von de Quatrefages und Hamy scheinen mit Sicherheit von Nordchinesen zu stammen (S. 435, Fussnote 3'). Auf der anderen Seite ist die Herkunft der von Reicher mitgeteilten Schädel (aus dem Anthropologischen Institut zu Moskau) fraglich, denn südchinesiche Schädel sind in Russland ebensogut wie nordchinesiche vorhanden. De Quatrefages und Hamy berichten z. B. über Chinesenschädel aus dem indischen Archipel in dem Petersburger Museum.

Schwierigkeiten macht noch die von Koganei mitgeteilte Serie. Dieser Autor hat Schädel von gefallenen chinesischen Soldaten aus dem chinesisch-japanischen Krieg bearbeitet; es ist durchaus möglich, dass er eine Beimischung von Mandschus vor sich gehabt hat. Alles in allem scheint es am sichersten, unsere Schlussfolgerungen über die Kraniologie Chinas auf Harrowers und Davidson Blacks Arbeiten aufzubauen, und wir merken als erstes Resultat an, dass eine zwar nicht grosse, aber doch deutliche Verschiedenheit zwischen Nord- und Südchinesen nachzuweisen ist.

Dank den Arbeiten Davidson Blacks sind wir weiterhin mit der Kraniologie der prähistorischen Bevölkerung Nordchinas bekannt gemacht worden. Die Serie stammt aus verschiedenen Gegenden Nordchinas: Kansu, Honan und der südlichen Mandschurei. Über die Einheitlichkeit der aus soweit von einander entfernten Orten gefundenen Schädel kann nach Davidson Black, der sich gleichfalls von dem C.R.L. führen liess, kein Zweifel aufkommen.

B. *Japaner.* Auch von Japan hat Morant Daten zusammengestellt und in der schon öfters angegebenen Arbeit verwandt. Mehr als anderswo hat sich hier ein Zusammenwerfen zahlreicher, zum Teil sehr kurzer Serien als notwendig erwiesen. Die Hauptmasse ist von Adachi geliefert worden, dessen Messungen von Morant noch weitere Schädel aus neun verschiedenen Sammlungen hinzugefügt wurden, von denen keine mehr als acht Schädel, drei aber nur einen umfassten. Inzwischen ist eine längere Serie von Ono veröffentlicht worden, die einen Vergleich mit der von Adachi gegebenen erlaubt. Onos Arbeit enthält die Mittelwerte einer Reihe anderer Serien, über die in japanischer Sprache und Schrift berichtet worden ist. Leider gibt er nicht die Anzahl der Schädel an, auf der diese Mittelwerte basiert sind, sodass sie einstweilen nicht weiter berücksichtigt werden können, da die Originalarbeiten weder in Europa noch in Amerika vorhanden sind. Man kann nur wünschen, dass eine biometrische Bearbeitung des umfangreichen japanischen Materiales nicht zu lange auf sich warten lassen wird!

Sowohl Ono als Adachi geben genaue Definitionen ihrer Masse, von denen nur die Masse der Orbita eine kurze Bemerkung erheischen. Adachi sagt über seine Messtechnik der Orbitalbreite: "Ich nehme als innern Orbitalrand die Crista lacrimalis posterior und zwar die hintere Grenzlinie ihrer Basis (weil die Bildung der Crista lacrimalis posterior selbst zu sehr variiert), ferner die künstliche Verbindungslinie des oberen Randes der Crista mit dem inneren Ende des Margo supraorbitalis. In dem so festgelegten Rande suche ich nach dem Augenmass die zwei inneren Ausgangspunkte für den horizontalen und den grössten Breitendurchmesser. Der erstere Punkt fällt in der Regel mit dem sogenannten hinteren Tränenpunkt (Point lacrymal postérieur) zusammen, der letztere liegt etwas höher." Adachis Mass ist also eben so gut mit *Lacr.* O_1 vergleichbar wie Martin's Orbitalbreite mit dem von Fawcett und von Macdonell definierten O_1. Es ist hier als *Lacr.* O_1 angesehen und verwandt worden.

Die beiden Serien stammen aus verschiedenen Teilen von Japan: Adachis von der Hauptinsel Hondo (Provinz Okayama), Onos von Kiushiu, aus dem Patho-

logisch-anatomischen Institut zu Fukuoka. Der C.R.L. zwischen den beiden beträgt $1{\cdot}19 \pm {\cdot}24$. Die Bevölkerungen der beiden Inseln sind also wahrscheinlich nicht wesentlich von einander verschieden, die beiden Serien sind hier zusammengelegt worden.

Wo angängig, sind die allein aus Onos und Adachis Messungen berechneten Mittelwerte verwandt worden. Für O_1 und O_1' sind nur Onos Bestimmungen vorhanden, die noch verbliebenen Lücken in der Liste sind mit den von Morant gegebenen Werten ergänzt worden. Für den Index *fmb*/*fml* ist $N = 16$ gesetzt, der von Morant gegebene Wert 19 dürfte, wie ein Vergleich mit den Zahlen von *fmb* und *fml* ergiebt, auf einem Druckfehler beruhen. Wenn auch das Material dadurch einen recht ungleichmässigen Umfang gewinnt, so scheint es doch besser, möglichst zahlreiche Werte für den C.R.L. verwenden zu können.

C. *Birmanen.* Schädel aus der Umgebung von Mulmein sind von Tildesley bearbeitet worden. Die ihr zur Verfügung stehende Sammlung wurde von ihr in drei Gruppen, *A*, *B* und *C* eingeteilt. Von diesen sind der Typ *B* und Typ *C* jeweils nur durch acht Schädel vertreten, für Vergleichszwecke ist hier nur Typ *A*, der den eigentlichen Birmanen entsprechen soll, verwandt worden. Zu beachten ist, dass Tildesley NH' nicht abgenommen hat, und dass die Schädelindices mit H, und nicht, wie sich später eingebürgert hat, mit H' berechnet worden sind. Wir haben, wo nötig, die aus dem Mittelwert von H' und L berechneten Indices verwandt. Die Zusammenstellung der Birmaschädel in Morants Arbeit enthält diese Werte bereits. Für den *Alv.* $P\angle$ ist die Zahl 39 gelesen (nicht 89!). G_2, das nach abweichender Methode gemessen war, so wie die Gaumenindices sind von Morant neu bestimmt worden und mir liebenswürdiger Weise zur Verfügung gestellt worden.

D. *Kham-Tibetaner.* In einigen Fällen sind die zuerst von Morant veröffentlichten Kham-Tibetaner, von dem Autor als "Tibetan *B*" bezeichnet, herangezogen worden. Es handelt sich hier um eine Rasse, die nach den von Morant gegebenen Resultaten ausserordentlich interessante anthropologische Probleme aufwirft. Morant konnte mittels des C.R.L. als ihre nächsten Verwandten die Moriori der Chatham Insel und die Feuerländer aufdecken. Man könnte sich so die Vorstellung eines Zweiges der Menschheit bilden, von dem Reste in die unzugänglichen Berge Ost-Tibets, auf die Inseln des stillen Oceans und nach dem Feuerland abgedrängt wären. Immerhin ist die tatsächliche Unterlage für diese aufgestellte Hypothese einstweilen recht wenig umfangreich. Sie basiert auf nur 15 Schädeln von Kham-Tibetanern und auf einer gleichfalls kaum ausreichenden Serie von Feuerländern, deren Mittelwerte zum guten Teil auf nur sechs Schädeln basiert werden konnten*.

Die Frage der Stellung der Kham-Tibetaner ist dann kurz wiederum von Davidson Black angeschnitten worden. Er gelangt zu dem Schluss, dass die prähistorische Bevölkerung Chinas mit der heutigen etwa eben so nahe verwandt ist, wie mit den Kham-Tibetanern.

* [Die Hypothese von der "Franse" Rassen, nämlich dass diese Rasse die abgesonderte und verschieden entwickelte Reste eines primitiven Zweiges der Menschheit sind, ist auf einen Blick weder anzunehmen, noch weniger abzuschlagen. Sie soll studiert werden. Man betrachtet nur die abgesonderten Lemuroidea. ED.]

E. *Telengeten.* Um die Stellung der Chinesen weiter festzulegen, war es wünschenswert, sie mit den Stämmen, die gemeinhin als Mongolen bezeichnet werden, vergleichen zu können. Morants Arbeit enthält in erster Linie eine, einer Arbeit von Reicher entnommene, Zusammenstellung mongolischer Rassen, von denen eine der kürzesten, die Mongolen-Torgouten, bereits von Davidson Black verwandt worden ist. Abgesehen von dem wenig umfangreichen Material, das von diesem Stamme bekannt ist, spricht auch dessen unruhige Vergangenheit gegen seine Verwendung. Um 1700 wanderten sie aus dem Inneren Asiens nach den Niederungen der Wolga und des Don aus, um später, nach Beilegung eines Streites mit der chinesischen Regierung, wieder in ihre alten Wohnsitze zurückzukehren. Es ist wohl nicht mit Sicherheit auszuschliessen, dass diese ausgedehnten Reisen zu einer Veränderung des Rassentypes geführt haben können.

Daher schien es sicherer, die gleichfalls von Reicher gemessenen Telengeten, die zudem eine längere Serie bilden, hier zu verwenden. Über diesen Stamm sind seit dem Erscheinen von Reichers Arbeit eine Reihe von Nachrichten bekannt geworden. Im Jahre 1914 wurden sie von Kaarlo Hildén, der sich einer Expedition von Dr J. G. Granö sich angeschlossen hatte, untersucht. Sein Bericht über diese Reise enthält eine Reihe von Messungen an Lebenden, auf die aber hier nicht eingegangen werden soll. Auch in Betreff der geographischen Verhältnisse des von den Telengeten und ihren Nachbarn bewohnten Gebietes, namentlich der Gebirgstäler des russischen Altais, sei auf die Arbeit von Hildén verwiesen. Die Mittelwerte aus den Messungen Reichers, die sich auf über 60 Schädel beziehen, sind z. T. von dem Autor selbst, z. T. von Morant gegeben. Eine Nachprüfung der Liste Morants ergab, dass der für U eingesetzte Wert von Reicher für den "Horizontalumfang, gemessen über die Glabella," gegeben war. Reichers Listen enthalten die Masse des Horizontalumfangs über das Ophryon, aus diesen ist der von uns in der Tabelle gegebene Mittelwert von U berechnet. Der Occipitalindex wurde aus Reichers Tabellen für die einzelnen Schädel berechnet. Bei Schädel 4457 haben wir für S_3 117 und nicht 197 gelesen, was offenbar ein Druckfehler ist. (Man berechne $S-(S_1+S_2)$!)

9. *Vergleichender Teil.* Es bleibt noch die Hauptaufgabe, nämlich die Gliederung der besprochenen Rassen festzustellen. Wir berechnen zu dem Zweck die C.R.L. und C.R.L.′ zwischen den verschiedenen Rassen. Die Mittelwerte enthält Tabelle XV, die ursprünglichen Koeffizienten Tabelle XVI, die reduzierten C.R.L.′ Tabelle XVII.

Wir sehen, wie seit Morants Analyse der Kraniologie Europas üblich, zwei Völker oder Stämme als rassenverwandt an, wenn der C.R.L.′ zwischen ihnen weniger als 8 beträgt, und reden von Gruppenverwandtschaft, wenn der C.R.L.′ zwischen 8 und 15 liegt. Es empfiehlt sich vielleicht, von enger Gruppenverwandtschaft zu reden, wenn der C.R.L.′ mit Rücksicht auf seinen wahrscheinlichen Fehler nicht wesentlich grösser als 8 ist.

Unter Anwendung dieses Kriteriums ergiebt sich die folgende Gruppierung:

1. Chinesen (Fukien), Chinesen (Peking) und Japaner mit Rassenverwandtschaft zwischen Chinesen (Fukien) und den beiden anderen, und Gruppenverwandtschaft zwischen Chinesen (Peking) und Japanern.

TABELLE XV.

Haupttabelle der Mittelwerte (Männliche Schädel).

	Borneo: Dajaks	Java: Bantam-Bat.	Java (Mittel u. Ost)	Philippinen: Tagalen	Philippinen: Aëtas	Andamanesen	Japaner (Ono, Adachi, u.s.w.)	Chinesen: Peking (Black)	Chinesen: Fukien (Harrower)	Kham-Tibetaner (Morant)	Telengeten (Reicher)	Birmanen A (Tildesley)	Chinesen: "Pooled Prehistorics" (Black)
Hirnschädel													
C	—	—	—	—	—	—	1474·8 (129)	—	1496·6 (36)	1537·7 (14)	1462·0 (45)	1406·9 (27)	—
L	176·6 (55)	169·9 (55)	173·7 (65)	179·2 (31)	171·0 (33)	166·6 (33)	180·5 (131)	178·5 (86)	179·9 (36)	185·5 (14)	175·8 (62)	173·5 (44)	180·3 (41)
F	174·7 (41)	168·4 (55)	172·6 (65)	178·4 (31)	170·1 (33)	166·9 (22)	—	—	—	184·5 (14)	—	172·4 (44)	—
B	138·2 (53)	140·8 (54)	142·2 (65)	138·9 (31)	143·5 (33)	136·4 (34)	139·9 (131)	138·2 (86)	140·9 (36)	139·4 (14)	151·5 (59)	143·7 (45)	138·6 (42)
H'	134·8 (47)	134·4 (55)	135·5 (62)	137·2 (26)	136·2 (29)	129·9 (34)	—	137·2 (86)	137·8 (36)	134·1 (15)	129·8 (61)	136·0 (43)	137·0 (42)
H	135·8 (46)	135·3 (55)	136·8 (62)	138·1 (24)	136·9 (29)	131·0 (18)	140·4 (131)	138·0 (86)	—	134·8 (15)	—	136·8 (43)	137·9 (42)
OH	115·4 (53)	113·4 (55)	115·1 (62)	116·8 (29)	115·9 (33)	113·3 (20)	—	115·5 (83)	119·3 (36)	115·5 (15)	114·4 (62)	117·7 (44)	116·0 (50)
LB	99·4 (49)	97·2 (54)	99·3 (65)	100·7 (25)	98·3 (29)	92·6 (33)	101·9 (27)	99·0 (86)	98·3 (36)	99·2 (15)	99·8 (62)	98·5 (43)	101·6 (40)
B'	93·2 (54)	90·8 (55)	93·1 (65)	94·3 (31)	92·8 (33)	92·3 (29)	94·6 (20)	89·4 (85)	91·5 (36)	94·3 (15)	94·6 (52)	94·3 (44)	91·1 (41)
S_1'	109·5 (39)	109·2 (54)	110·2 (65)	114·2 (31)	112·2 (33)	105·8 (19)	—	—	113·1 (36)	—	111·8 (62)	—	—
S_2'	109·3 (39)	105·4 (55)	108·3 (65)	114·3 (31)	107·4 (33)	107·7 (19)	—	—	—	—	107·0 (61)	—	—
S_3'	97·1 (36)	95·5 (54)	96·6 (65)	97·9 (27)	95·6 (33)	91·4 (19)	—	—	99·3 (36)	100·3 (15)	92·9 (60)	94·7 (44)	—
S_1	125·0 (39)	123·8 (54)	125·2 (65)	131·2 (31)	127·3 (33)	119·8 (25)	—	—	128·0 (36)	129·3 (15)	126·4 (62)	128·6 (44)	—
S_2	124·2 (39)	119·5 (55)	123·7 (65)	129·4 (31)	121·3 (33)	122·0 (24)	—	—	130·6 (36)	126·1 (14)	118·6 (61)	124·0 (45)	—
S_3	114·0 (36)	109·8 (54)	111·4 (65)	115·1 (27)	110·5 (31)	106·0 (24)	—	—	118·1 (36)	122·7 (15)	112·8 (60)	111·2 (44)	—
S	365·0 (46)	353·3 (54)	360·4 (65)	375·0 (27)	360·0 (31)	349·0 (27)	370·5 (25)	370·0 (82)	377·0 (36)	378·6 (14)	357·1 (62)	363·7 (44)	371·9 (36)
βQ'	309·1 (38)	312·6 (54)	316·9 (65)	316·2 (30)	319·0 (33)	299·1 (23)	—	—	—	—	—	—	—
Q'	312·6 (53)	313·9 (54)	318·4 (30)	317·5 (30)	323·7 (33)	300·7 (23)	320·6 (14)	317·0 (60)	322·0 (36)	312·9 (14)	320·1 (61)	325·8 (43)	312·3 (37)
U	500·6 (41)	491·8 (53)	501·0 (65)	508·3 (30)	496·3 (33)	481·0 (16)	508·8 (28)	502·2 (74)	510·5 (36)	525·6 (14)	516·1 (62)	505·7 (—	507·1 (34)
Gl. U	506·2 (54)	494·7 (53)	503·3 (65)	511·8 (30)	499·2 (33)	483·0 (24)	—	—	—	—	519·3 (62)	—	—
Gesicht													
J	132·9 (52)	132·0 (52)	134·7 (65)	131·7 (23)	132·8 (30)	123·3 (32)	134·1 (128)	132·7 (83)	132·6 (36)	137·5 (15)	140·1 (51)	134·0 (40)	132·2 (37)
G'H	69·7 (45)	69·8 (50)	70·9 (65)	70·0 (26)	69·6 (27)	61·7 (31)	71·3 (122)	75·3 (84)	73·8 (36)	76·5 (15)	71·3 (44)	71·4 (39)	75·2 (35)
PH	18·8 (33)	19·3 (40)	19·2 (65)	18·8 (21)	19·1 (25)	16·3 (18)	100·2 (9)	—	—	22·0 (15)	—	19·9 (38)	—
GB	100·8 (52)	98·2 (54)	101·1 (65)	100·3 (24)	98·3 (31)	95·2 (20)	98·8 (135)	97·9 (83)	99·3 (36)	100·7 (15)	100·7 (58)	101·9 (40)	102·0 (32)
GL	95·6 (42)	96·4 (50)	97·5 (65)	96·6 (22)	94·3 (26)	90·5 (31)	—	—	96·0 (36)	97·2 (15)	—	96·6 (39)	—
Nase													
NHR	52·7 (48)	51·7 (54)	52·7 (65)	53·1 (27)	51·6 (32)	47·5 (19)	—	—	—	54·9 (15)	—	53·4 (41)	—
NHL	53·1 (38)	51·5 (54)	52·7 (65)	53·4 (27)	51·7 (32)	47·6 (20)	—	55·3 (86)	—	55·1 (15)	—	53·5 (41)	54·7 (42)
NH'	50·2 (39)	49·3 (54)	50·6 (65)	50·0 (26)	49·5 (31)	46·2 (31)	52·0 (138)	—	52·6 (36)	—	52·4 (61)	—	—
NB	27·2 (50)	26·3 (54)	26·8 (65)	27·7 (25)	26·8 (32)	23·8 (34)	25·3 (138)	25·0 (86)	25·2 (36)	27·1 (15)	26·8 (60)	28·1 (41)	25·8 (41)
SC	8·3 (41)	8·6 (53)	8·4 (65)	9·6 (27)	8·3 (32)	10·1 (18)	—	—	—	7·7 (15)	8·1 (60)	9·0 (42)	—
SS	2·8 (37)	2·8 (53)	2·8 (62)	3·4 (27)	3·1 (26)	2·7 (18)	—	—	—	2·6 (15)	—	3·0 (41)	—
DC	20·7 (39)	21·2 (51)	22·3 (60)	22·8 (15)	21·6 (27)	22·6 (18)	—	20·2 (61)	—	22·7 (15)	—	22·8 (43)	21·4 (31)
DS	8·2 (39)	8·7 (51)	8·6 (60)	8·9 (15)	9·2 (27)	9·7 (18)	—	—	—	8·8 (15)	—	10·3 (42)	—
DA	28·4 (39)	28·8 (50)	29·4 (60)	30·6 (15)	29·3 (27)	32·9 (16)	—	—	—	29·4 (15)	—	32·6 (41)	—
Orbita													
O_1R	42·5 (41)	42·7 (55)	43·3 (65)	43·2 (26)	42·7 (32)	40·4 (22)	41·8 (98)	44·0 (62)	—	44·0 (15)	41·9 (62)	44·2 (41)	44·4 (34)
$O_1'R$	39·8 (37)	39·2 (46)	39·7 (49)	40·0 (15)	40·0 (26)	37·3 (18)	40·0 (98)	—	38·7 (36)	41·2 (15)	—	39·6 (41)	—

DC	20·7 (39)	21·2 (51)	22·3 (60)	22·8 (15)	21·6 (27)	22·6 (18)	—	20·2 (61)	—	22·7 (15)	—	22·8 (43)	21·4 (31)
DS	8·2 (39)	8·7 (51)	8·6 (60)	8·9 (15)	9·2 (27)	9·7 (18)	—	—	—	8·8 (15)	—	10·3 (42)	—
DA	28·4 (39)	28·8 (50)	29·4 (60)	30·6 (15)	29·3 (27)	32·9 (16)	—	—	—	29·4 (15)	—	32·6 (41)	—
Orbita													
O_1R	42·5 (41)	42·7 (55)	43·3 (65)	43·2 (26)	42·7 (32)	40·4 (22)	41·8 (98)	44·0 (62)	—	44·0 (15)	41·9 (62)	44·2 (41)	44·4 (34)
$O_1'R$	39·8 (37)	39·2 (46)	39·7 (49)	40·0 (15)	40·0 (26)	37·3 (18)	40·0 (98)	—	38·7 (36)	41·2 (15)	—	39·6 (41)	—
Lacr. O_1R	38·5 (44)	38·5 (46)	39·1 (54)	39·1 (14)	39·5 (16)	36·6 (12)	38·5 (98)	—	—	—	—	—	—
O_2R	33·5 (51)	33·6 (55)	34·1 (65)	33·3 (26)	33·4 (32)	33·4 (22)	34·2 (98)	35·5 (74)	34·6 (36)	36·5 (15)	34·1 (61)	35·0 (41)	33·8 (32)
O_1L	42·0 (40)	41·8 (55)	42·3 (65)	42·8 (29)	42·5 (32)	39·7 (22)	41·4 (98)	—	—	43·4 (15)	—	43·6 (41)	—
$O_1'L$	39·4 (36)	38·5 (46)	38·7 (47)	39·6 (16)	39·5 (26)	37·0 (18)	39·6 (98)	—	38·5 (36)	—	—	—	—
Lacr. O_1L	38·2 (35)	37·7 (40)	38·0 (51)	38·6 (13)	39·0 (18)	36·0 (15)	38·4 (138)	—	—	—	—	—	—
O_2L	33·7 (39)	33·8 (55)	34·2 (65)	33·6 (28)	33·6 (32)	33·3 (22)	34·6 (138)	—	34·8 (36)	36·7 (15)	—	35·0 (41)	—
Gaumen u.s.w.													
G_1	49·5 (29)	50·7 (51)	50·1 (65)	49·3 (23)	48·2 (26)	46·4 (20)	49·8 (15)	50·5 (59)	49·0 (36)	51·5 (13)	—	49·9 (37)	50·9 (37)
G_1'	45·6 (37)	46·4 (51)	46·1 (65)	45·7 (18)	44·4 (25)	43·3 (19)	47·5 (6)	45·2 (85)	—	47·7 (13)	46·8 (40)	45·4 (37)	46·1 (36)
G_2	40·6 (36)	40·3 (43)	41·0 (58)	40·6 (13)	38·6 (13)	37·6 (18)	38·5 (6)	40·5 (57)	40·8 (36)	43·6 (14)	41·4 (38)	41·6 (29)	43·6 (33)
EH	12·4 (28)	12·1 (40)	12·3 (54)	12·6 (13)	12·0 (13)	11·3 (13)	—	—	—	14·2 (14)	—	—	—
fml	36·1 (45)	35·7 (55)	35·4 (65)	35·5 (23)	34·6 (28)	32·6 (33)	36·4 (16)	35·7 (86)	35·5 (36)	37·4 (15)	36·6 (58)	36·7 (43)	36·4 (34)
fmb	30·2 (46)	29·2 (55)	29·6 (65)	29·6 (22)	29·4 (29)	27·2 (22)	30·4 (16)	30·0 (86)	29·4 (36)	31·4 (15)	30·1 (59)	30·7 (42)	30·2 (33)
Alv. $P\angle$	84°·7 (29)	84°·9 (46)	83°·4 (61)	87°·0 (25)	87°·5 (27)	85°·0 (13)	—	—	84°·7 (36)	85°·7 (14)	—	86°·0 (39)	—
Prosth. $P\angle$	82°·7 (31)	81°·1 (51)	81°·5 (61)	84°·2 (22)	85°·0 (25)	81°·8 (20)	84°·5 (130)	83°·4 (80)	—	—	85°·1 (36)	—	85°·0 (32)
Indices*													
100 B/L	78·4 (53)	83·0 (54)	82·0 (65)	77·5 (31)	84·0 (33)	81·9 (33)	77·5 (131)	77·6 (86)	78·8 (36)	75·3 (14)	86·4 (60)	82·9 (44)	76·0 (40)
100 H'/L	76·5 (47)	79·2 (55)	78·1 (62)	76·9 (26)	79·4 (29)	78·0 (33)	—	77·0 (86)	77·0 (36)	72·1 (14)	73·7 (61)	{78·4 (43)}	76·0 (39)
100 H/L	{76·9 (46)}	{79·6 (55)}	{78·8 (62)}	{77·1 (24)}	{80·1 (29)}	{78·6 (18)}	78·0 (131)	77·5 (86)	—	72·4 (14)	—	78·5 (43)	76·6 (38)
100 B/H'	102·9 (47)	104·9 (54)	105·1 (62)	101·2 (26)	105·7 (29)	105·0 (34)	—	100·5 (86)†	102·3 (36)	104·5 (14)	{116·7 (59)}	{105·7 (43)}	100·8 (38)†
100 B/H	{101·8 (46)}	{104·1 (54)}	{104·0 (62)}	{100·6 (24)}	{104·8 (29)}	{104·1 (18)}	{99·6 (131)}	100·1 (86)†	—	104·0 (14)	—	105·8 (43)	100·4 (38)
100 $(B—H')/L$	2·2 (47)	4·0 (54)	3·8 (62)	0·9 (26)	4·6 (29)	3·9 (33)	—	{0·6 (86)}	{1·7 (36)}	3·5 (14)	{12·3 (59)}	{4·4 (43)}	{0·9 (41)}
Oc. I.	63·2 (36)	66·2 (54)	65 4 (65)	62·6 (27)	65·0 (31)	62·7 (18)	—	61·05 (82)	61·8 (36)	59·2 (15)	61·0 (60)	62·8 (44)	61·9 (39)
100 $G'H/GB$	69·2 (45)	71·0 (49)	70·2 (65)	70·3 (23)	70·8 (25)	66·2 (20)	72·4 (120)	77·0 (81)	73·8 (36)	76·0 (15)	{68·8 (44)}	69·8 (38)	73·6 (27)
100 NB/NHR, *O.L*	51·4 (47)	51·0 (53)	51·0 (65)	52·1 (24)	52·0 (32)	50·9 (19)	—	45·3 (86)	—	49·5 (15)	—	52·8 (41)	47·6 (39)
100 NB/NH'	54·5 (39)	53·5 (53)	53·1 (65)	55·5 (24)	54·1 (31)	51·5 (30)	48·8 (138)	—	48·1 (36)	—	51·4 (60)	—	—
100 DS/DC	39·8 (39)	41·5 (51)	38·6 (60)	39·4 (15)	42·9 (27)	43·2 (18)	—	—	—	39·1 (15)	—	45·4 (42)	—
100 SS/SC	32·1 (36)	33·4 (53)	32·6 (62)	36·0 (27)	35·3 (26)	27·0 (18)	—	—	—	34·6 (15)	—	32·7 (41)	—
100 O_2/O_1R	79·4 (41)	78·8 (55)	78·9 (65)	77·1 (26)	78·5 (32)	82·6 (20)	82·0 (98)	80·7 (62)	—	83·0 (15)	81·6 (61)	79·1 (41)	76·2 (35)
100 O_2/O_1L	80·4 (40)	80·9 (55)	80·8 (65)	78·7 (28)	78·7 (32)	83·7 (20)	83·3 (98)	—	—	84·6 (15)	—	80·0 (41)	—
100 $O_2/O_1'R$	{84·7 (37)}	{85·7 (46)}	{85·9 (49)}	82·5 (15)	84·2 (26)	90·2 (18)	85·7 (98)	—	89·4 (36)	88·6 (15)	—	{88·4 (41)}	—
100 $O_2/Lacr.\,O_1R$, *O.L*	86·8 (44)	87·3 (46)	87·6 (54)	{85·2 (14)}	{86·2 (18)}	{92·5 (15)}	89·9 (138)	—	—	—	—	—	—
100 G_2/G_1	81·4 (27)	79·8 (42)	82·0 (58)	82·3 (13)	80·4 (13)	81·1 (16)	{77·3 (6)}	80·5 (56)	83·5 (36)	84·1 (12)	—	84·0 (27)	85·0 (28)
100 G_2/G_1'	89·4 (34)	86·9 (43)	88·9 (58)	{88·8 (13)}	{86·9 (13)}	{80·8 (18)}	{81·0 (6)}	89·3 (56)	—	{91·4 (13)}	88·6 (38)	91·4 (27)	95·2 (32)
100 EH/G_2	30·7 (28)	30·2 (40)	30·1 (54)	30·9 (13)	31·1 (13)	30·0 (13)	—	—	—	31·7 (14)	—	—	—
100 fmb/fml	83·8 (45)	82·1 (55)	83·9 (65)	83·7 (22)	85·1 (28)	82·3 (20)	{83·2 (16)}	84·45 (86)	83·0 (36)	84·1 (15)	82·4 (58)	83·8 (42)	83·0 (32)
Winkel*, Gesicht													
$B\angle$	41°·8 (41)	42°·2 (50)	42°·2 (65)	41°·9 (21)	42°·4 (25)	39°·1 (31)	{41°·7 (9)}	—	43°·6 (36)	45°·7 (15)	—	42°·6 (38)	—
$A\angle$	72°·2 (41)	69°·5 (50)	70°·3 (65)	71°·8 (21)	72°·4 (25)	72°·3 (31)	{70°·1 (9)}	—	70°·5 (36)	68°·8 (15)	—	70°·5 (38)	—
$N\angle$	65°·9 (41)	68°·3 (50)	67°·6 (65)	66°·3 (21)	65°·2 (25)	68°·6 (31)	{68°·2 (9)}	—	65°·9 (36)	65°·5 (15)	—	66°·8 (38)	—
Nasenbrücke													
ϕ'	{32°42′(36)}	{33°45′(53)}	{33°6′ (62)}	{35°45′(20)}	{35°13′(26)}	{28°22′(18)}	—	—	—	{34°41′(15)}	—	{33°11′(41)}	—
ϕ	{41°1′ (37)}	{43°8′ (51)}	{39°50′(60)}	{39°48′(15)}	{42°31′(26)}	{48°2′ (18)}	—	—	—	{39°30′(15)}	—	{46°37′(41)}	—

* Angaben in { } sind aus Mittelwerten der absoluten Masse berechnet.

† Reziproke Werte der von Black gegebenen Indices × 10000.

TABELLE XVI.

Ursprüngliche Koeffizienten der Rassenähnlichkeit.

	Java (Bantam u. Batavia) (52·7)	Java (Mittel u. Ost) (63·7)	Birmanen A (40·7)	Philippinen: Aëtas (28·8)	Philippinen: Tagalen (25·0)	Borneo: Dajaks (45·2)	Chinesen(Peking) (78·7)	Chinesen (Fukien) (36·0)	Japaner (88·4)	Andamanesen (26·9)
Java (Bantam u. Batavia) (52·7)	—	2·71 ± ·17 (30)* 0·64 ± ·28 (12)†	8·22 ± ·17 (30) 4·91 ± ·28 (12)	2·84 ± ·17 (30) 4·25 ± ·28 (12)	10·88 ± ·17 (30) 12·63 ± ·28 (12)	8·51 ± ·17 (30) 12·50 ± ·28 (12)	26·85 ± ·18 (28) 40·08 ± ·30 (10)	14·62 ± ·17 (30) 14·88 ± ·28 (12)	25·80 ± ·19 (25) 39·63 ± ·34 (8)	15·68 ± ·17 (30) 4·22 ± ·28 (12)
Java (Mittel u. Ost) (63·7)	2·71 ± ·17 (30)* 0·64 ± ·28 (12)†	—	2·44 ± ·17 (30) 2·69 ± ·28 (12)	2·37 ± ·17 (30) 3·96 ± ·28 (12)	5·76 ± ·17 (30) 8·75 ± ·28 (12)	4·75 ± ·17 (30) 7·09 ± ·28 (12)	20·62 ± ·18 (28) 32·86 ± ·30 (10)	8·92 ± ·17 (30) 11·23 ± ·28 (12)	18·36 ± ·19 (25) 34·31 ± ·34 (8)	25·58 ± ·17 (30) 2·47 ± ·28 (12)
Birmanen A (40·7)	8·22 ± ·17 (30) 4·91 ± ·28 (12)	2·44 ± ·17 (30) 2·69 ± ·28 (12)	—	3·18 ± ·17 (30) 1·48 ± ·28 (12)	5·88 ± ·17 (30) 7·61 ± ·28 (12)	7·07 ± ·17 (30) 7·43 ± ·28 (12)	19·93 ± ·18 (27) 31·91 ± ·32 (9)	7·42 ± ·18 (29) 7·52 ± ·29 (11)	19·78 ± ·20 (23) 35·59 ± ·39 (6)	29·18 ± ·17 (30) 1·95 ± ·28 (12)
Philippinen: Aëtas (28·8)	2·84 ± ·17 (30) 4·25 ± ·28 (12)	2·37 ± ·17 (30) 3·96 ± ·28 (12)	3·18 ± ·17 (30) 1·48 ± ·28 (12)	—	6·97 ± ·17 (30) 9·91 ± ·28 (12)	6·85 ± ·17 (30) 10·15 ± ·28 (12)	20·32 ± ·18 (28) 31·19 ± ·30 (10)	10·76 ± ·17 (30) 13·93 ± ·28 (12)	17·42 ± ·19 (25) 31·91 ± ·34 (8)	15·66 ± ·17 (30) 5·04 ± ·28 (12)
Philippinen: Tagalen (25·0)	10·88 ± ·17 (30) 12·63 ± ·28 (12)	5·76 ± ·17 (30) 8·75 ± ·28 (12)	5·88 ± ·17 (30) 7·61 ± ·28 (12)	6·97 ± ·17 (30) 9·91 ± ·28 (12)	—	0·71 ± ·17 (30) 0·13 ± ·28 (12)	8·76 ± ·18 (28) 9·83 ± ·30 (10)	5·16 ± ·17 (30) 6·97 ± ·28 (12)	5·27 ± ·19 (25) 9·08 ± ·34 (8)	22·86 ± ·17 (30) 7·74 ± ·28 (12)
Borneo: Dajaks (45·2)	8·51 ± ·17 (30) 12·50 ± ·28 (12)	4·75 ± ·17 (30) 7·09 ± ·28 (12)	7·07 ± ·17 (30) 7·43 ± ·28 (12)	6·85 ± ·17 (30) 10·15 ± ·28 (12)	0·71 ± ·17 (30) 0·13 ± ·28 (12)	—	15·41 ± ·18 (28) 16·59 ± ·30 (10)	7·10 ± ·17 (30) 6·87 ± ·28 (12)	9·50 ± ·19 (25) 14·06 ± ·34 (8)	22·29 ± ·17 (30) 5·61 ± ·28 (12)
Chinesen (Peking) (78·7)	26·85 ± ·18 (28) 40·08 ± ·30 (10)	20·62 ± ·18 (28) 32·86 ± ·30 (10)	19·93 ± ·18 (27) 31·91 ± ·32 (9)	20·32 ± ·18 (28) 31·19 ± ·30 (10)	8·76 ± ·18 (28) 9·83 ± ·30 (10)	15·41 ± ·18 (28) 16·59 ± ·30 (10)	—	2·60 ± ·20 (23) 2·73 ± ·36 (7)	10·41 ± ·20 (23) 6·70 ± ·36 (7)	43·44 ± ·18 (28) 20·23 ± ·30 (10)
Chinesen (Fukien) (36·0)	14·62 ± ·17 (30) 14·88 ± ·28 (12)	8·92 ± ·17 (30) 11·23 ± ·28 (12)	7·42 ± ·18 (29) 7·52 ± ·29 (11)	10·76 ± ·17 (30) 13·93 ± ·28 (12)	5·16 ± ·17 (30) 6·97 ± ·28 (12)	7·10 ± ·17 (30) 6·87 ± ·28 (12)	2·60 ± ·20 (23) 2·73 ± ·36 (7)	—	2·71 ± ·20 (22) 3·70 ± ·43 (5)	27·51 ± ·17 (30) 6·83 ± ·28 (12)
Japaner (88·4)	25·80 ± ·19 (25) 39·63 ± ·34 (8)	18·36 ± ·19 (25) 34·31 ± ·34 (8)	19·78 ± ·20 (23) 35·59 ± ·39 (6)	17·42 ± ·19 (25) 31·91 ± ·34 (8)	5·27 ± ·19 (25) 9·08 ± ·34 (8)	9·50 ± ·19 (25) 14·06 ± ·34 (8)	10·41 ± ·20 (23) 6·70 ± ·36 (7)	2·71 ± ·20 (22) 3·70 ± ·43 (5)	—	40·26 ± ·19 (25) 16·58 ± ·34 (8)
Andamanesen (26·9)	15·68 ± ·17 (30) 4·22 ± ·28 (12)	25·58 ± ·17 (30) 2·47 ± ·28 (12)	29·18 ± ·17 (30) 1·95 ± ·28 (12)	15·66 ± ·17 (30) 5·04 ± ·28 (12)	22·86 ± ·17 (30) 7·74 ± ·28 (12)	22·29 ± ·17 (30) 5·61 ± ·28 (12)	43·44 ± ·18 (28) 20·23 ± ·30 (10)	27·51 ± ·17 (30) 6·83 ± ·28 (12)	40·26 ± ·19 (25) 16·58 ± ·34 (8)	—

* Alle Gliedmaßen. † Indices und Winkel.

TABELLE XVII.

Reduzierte Koeffizienten der Rassenähnlichkeit.

	Java (Bantam u. Batavia)	Java (Mittel u. Ost)	Birmanen A	Philippinen: Aëtas	Philippinen: Tagalen	Borneo: Dajaks	Chinesen (Peking)	Chinesen (Fukien)	Japaner	Andamanesen
Java (Bantam u. Batavia)	—	4·70 ± ·30	17·93 ± ·38	7·63 ± ·47	32·08 ± ·51	17·49 ± ·36	42·43 ± ·28	34·14 ± ·41	38·97 ± ·29	44·01 ± ·49
Java (Mittel u. Ost)	4·70 ± ·30	—	4·92 ± ·35	5·98 ± ·44	23·27 ± ·48	8·98 ± ·33	29·32 ± ·26	19·38 ± ·38	24·93 ± ·26	67·64 ± ·46
Birmanen A	17·93 ± ·38	4·92 ± ·35	—	9·38 ± ·52	18·98 ± ·56	16·51 ± ·41	37·00 ± ·34	19·53 ± ·47	35·67 ± ·36	90·07 ± ·54
Philippinen: Aëtas	7·63 ± ·47	5·98 ± ·44	9·38 ± ·52	—	26·05 ± ·65	19·48 ± ·49	47·95 ± ·43	33·63 ± ·54	39·88 ± ·44	56·30 ± ·63
Philippinen: Tagalen	32·08 ± ·51	23·27 ± ·48	18·98 ± ·56	26·05 ± ·65	—	2·20 ± ·54	22·94 ± ·47	17·47 ± ·59	13·52 ± ·49	88·21 ± ·67
Borneo: Dajaks	17·49 ± ·36	8·98 ± ·33	16·51 ± ·41	19·48 ± ·49	2·20 ± ·54	—	26·72 ± ·31	17·72 ± ·43	15·73 ± ·32	66·11 ± ·52
Chinesen (Peking)	42·43 ± ·28	29·32 ± ·26	37·00 ± ·34	47·95 ± ·43	22·94 ± ·47	26·72 ± ·31	—	5·16 ± ·39	12·86 ± ·25	112·55 ± ·47
Chinesen (Fukien)	34·14 ± ·41	19·38 ± ·38	19·53 ± ·47	33·63 ± ·54	17·47 ± ·59	17·72 ± ·43	5·16 ± ·39	—	5·41 ± ·41	90·73 ± ·57
Japaner	38·97 ± ·29	24·93 ± ·26	35·67 ± ·36	39·88 ± ·44	13·52 ± ·49	15·73 ± ·32	12·86 ± ·25	5·41 ± ·41	—	102·04 ± ·48
Andamanesen	44·01 ± ·49	67·64 ± ·46	90·07 ± ·54	56·30 ± ·63	88·21 ± ·67	66·11 ± ·52	112·55 ± ·47	90·73 ± ·57	102·04 ± ·48	—

2. Tagalen und Dajaks.

3. Beide Serien aus Java, Aëtas und Birmanen, mit Rassenverwandtschaft zwischen den meisten Paaren, aber mit nur enger Gruppenverwandtschaft zwischen Birmanen und Aëtas, und ohne Verwandtschaft zwischen Bantam-Batavia und Birmanen.

Bindungen zwischen den drei Gruppen lassen sich nachweisen: es besteht eine Gruppenverwandtschaft zwischen Japanern und Tagalen, und sogar eine enge Gruppenverwandtschaft zwischen Dajaks und Mittel Java. Dieser letztere Punkt hängt offensichtlich mit der oben schon erwähnten Tatsache zusammen, dass die Mitteljavaner keine homogene Serie darstellen—und die Dajaks möglicherweise auch nicht. Aber eine weitergehende Entwirrung dieser Verhältnisse ist wohl nur nach Herbeischaffung von neuem Tatsachenmaterial zu erhoffen.

Hier bescheiden wir uns mit dem vorläufigen Ergebnis, dass sich in dem betrachteten Gebiet drei "Rassen" unterscheiden lassen, eine "fernöstliche," die Davidson Blacks "Oriental Race" entsprechen dürfte und eine "malayische," zu der die Javaner mit ihren Anverwandten zu rechnen wären. Für die dritte durch die Tagalen und Dajaks vertretene Rasse liegt kein allgemein anerkannter Ausdruck vor. Wenn keine Verwechslung zu befürchten wäre, könnte man vorschlagen, auf sie den Namen "Nesiot" anzuwenden, als deren "ziemlich typische Vertreter" Haddon die Murut von Borneo anführt.

Die einzige Gruppe, der bis jetzt unberücksichtigt geblieben ist, umfasst die Andamanesen. Doch auch hier lassen sich Fingerzeige auf eine Verwandtschaft entdecken, wenn man die C.R.L. von Tabelle XVI durchgeht. Es fällt zunächst auf, dass durchgehends die C.R.L. der zweiten Zeile (die auf Indices und Winkeln, mit anderen Worten also auf der Form der Schädel beruhen) erheblich kleiner als die der ersten Zeile sind, ja dass zwei von ihnen, die zwischen Andamanesen und Birmanen sowie Mitteljavanern, kleiner als 3 sind. Das liegt dem Gedanken nahe in den Andamanesen einen Zweig der malayischen Rasse zu erblicken, der zwar von kleineren Proportionen als dieser, aber von sehr ähnlicher Form ist.

Als das wichtigste negative Ergebnis sehen wir die Schlussfolgerung an, das Bestehen einer einheitlichen Negritorasse ablehnen zu müssen. Es erübrigt sich auf das Negritoproblem des näheren einzugehen, vor kurzem erst erschien eine Studie aus der Feder v. Eickstedts, die den folgenden kurzen Bemerkungen zu Grunde gelegt ist: Als Überreste der Negritorasse werden die Andamanesen, die Aëtas und die Semang auf der Malakkahalbinsel angesehen, und es wird ausgesprochen, dass es sich hier um die letzten Reste einer alten südasiatischen Rassenschicht handelt.

An dieser Stelle kann hierzu selbstverständlich nur von der Kraniologie aus Stellung genommen werden. Eine Rassenverwandtschaft in dem am Eingang dieses Abschnittes definierten Sinne zwischen Aëtas und Andamanesen muss abgelehnt werden.

Leider ist unsere Kenntnis der Semangs noch gänzlich unzureichend.

Kiffner hat kürzlich die wenigen veröffentlichten Schädel zusammengestellt, man gewinnt aus den mitgeteilten Werten nicht den Eindruck, dass die Semang in ihrem Schädelbau eine nahe Verwandtschaft zu den Negritos oder den Andamanesen aufweisen!

Wenn wir somit auch für die Gegenwart eine Negritorasse ablehnen müssen, so wäre noch der zweite Teil des Negritoproblems, die Rolle dieser Rasse in der Entwicklungsgeschichte der Menschheit zu prüfen. Dass Andamanesen und Aëtas sich von einer gemeinsamen Wurzel herleiten, ist nach dem was oben gesagt ist, durchaus möglich, aber diese gemeinsame Wurzel hätte auch die Vorfahren der Birmanen und der Javaner zu umfassen, sodass für sie die Namengebung "Negritos" zum mindesten ungeschickt erschiene. Es ist auch fraglich, ob diese Urrasse eine so geringe Körpergrösse gehabt hat, wie man sie den Negritos im allgemeinen zuschreibt.

Wesentlich ungezwungener scheint uns die Auffassung, in den Andamanesen sowohl wie in den Aëtas Zweige der Malayen—in dem Sinne der hier gegebenen Definition—zu erblicken, die unabhängig von einander zu Pygmäenrassen verkümmert sind. Bemerkenswert ist es, dass sich hierbei jeweils die Körpergrösse unabhängig von der Grösse des Schädels verändert zu haben scheint. Denn die Aëtas (147·0 cm., Newton) sind zwar kleiner als die Andamanesen (148·4 cm., Census of India), haben aber grössere Köpfe. Wir halten demnach mit Schwalbe dafür, dass Pygmäen lokal entstehen, und lehnen die Kollmann'sche Hypothese einer einheitlichen "globalen" Pygmäenrasse ab. In beiden hier behandelten Fällen scheint es durchaus verständlich, dass Isolierung und vielleicht auch die besonderen Umweltbedingungen, die damit verknüpft waren, zur Veränderung der Körpermasse geführt haben.

Der nächstliegende Einwand gegen alle diese Überlegungen ist der, dass sie sich ausschliesslich auf Schädelmessungen stützen, und damit gegen alte Heiligtümer anthropologischer Methodik, wie Haare, Farbe von Haut und Augen, angehen. Aber der Wert, den man den einzelnen Merkmalen bei der Rasseneinteilung zuschreibt, ist einstweilen noch wenig objektiv bestimmt, und es dürfte auf keinen Fall erlaubt sein, den Schädelbau zu übergehen. Darauf hinzuweisen, dass sich dieser nicht mit den herrschenden Auffassungen verträgt, schien uns gerechtfertigt.

Zu dem Begriff der fernöstlichen Rasse ergeben sich Fragestellungen, deren wenigstens vorläufige Beantwortung auf Grund des oben besprochenen Materiales möglich erscheint.

Zunächst ist die Kenntnis der "Pooled Prehistorics" geeignet, Anhaltspunkte über die Vergangenheit der Rasse zu geben, des weiteren wäre die Frage der Verwandtschaft mit den Kham-Tibetanern zu verfolgen. Die dazu nötigen C.R.L. und C.R.L.′ enthält Tabelle XVIII. Der C.R.L. zwischen Kham-Tibetaner und Nordchinesen ist nach den von Davidson Black, der zwischen Kham-Tibetaner und Fukien nach den von Harrower gegebenen Werten der α's berechnet. Im ersteren Falle sind aber die Winkel, die Davidson Black zum Prosthion, Morant zum

Alveolarpunkt hin gemessen hat, fortgelassen; im zweiten sind Orbitalbreite die von Morant als O_1, von Harrower als O_1' gemessen sind, und Orbitalindex ausgelassen. Während Davidson Blacks Werte sich nur wenig verschieben, macht das bei Harrowers Serie einen gewaltigen Unterschied!

TABELLE XVIII.

Koeffizienten der Rassenähnlichkeit zwischen fernöstlichen Rassen.

	Chinesen: "Pooled Prehistorics" (36·4)	Chinesen (Peking) (78·7)	Chinesen (Fukien) (36·0)	Japaner (88·4)
Kham-Tibetaner (14·5)	4·56 ± ·18 (27)* 5·32 ± ·32 (9)† 22·01 ± ·89‡	7·61 ± ·18 (27) 7·66 ± ·32 (9) 31·19 ± ·75	5·19 ± ·18 (29) 4·54 ± ·29 (11) 28·73 ± ·86	9·09 ± ·20 (23) 11·58 ± ·39 (6) 36·87 ± ·81
Chinesen: "Pooled Prehistorics" (36·4)	—	4·80 ± ·18 (28) 6·09 ± ·30 (10) 9·64 ± ·36	3·46 ± ·20 (23) 2·60 ± ·36 (7) 9·56 ± ·55	6·82 ± ·20 (23) 7·12 ± ·36 (7) 13·51 ± ·39

* Alle Charaktere. † Indices und Winkel. ‡ Reduzierte.

Wir betrachten auch hier wieder die reduzierten Koeffizienten. Es besteht eine Gruppenverwandtschaft zwischen den "Pooled Prehistorics" einerseits und den Nordchinesen und den Japanern anderseits, und eine enge Gruppenverwandtschaft zwischen den "Pooled Prehistorics" und den Südchinesen, während sich keine Verwandtschaft der Kham-Tibetaner mit irgend einem Glied der fernöstlichen Rasse aufdecken lässt.

Bekanntlich ist die Herkunft des chinesischen Volkes umstritten. Wenn auch vielfach die Annahme einer Einwanderung der "Chinesen" vom Norden aus gemacht wird, so fehlt es doch nicht an Stimmen, die eine südliche Herkunft für wahrscheinlicher halten. Vielfach spielen hierbei allerdings ethnologische, m. a. W. kulturelle Gesichtspunkte mit, für manche Autoren sind offensichtlich "Chinesen" gleichbedeutend mit denjenigen, die die diesem Lande eigentümliche Kultur dort einführten. Physische Anthropologie vermag allerdings zu einer derartigen Fragestellung nichts beizutragen, sondern kann es höchstens unternehmen, aus den körperlichen Eigenschaften der Bewohner Chinas Rückschlüsse auf deren Herkunft anzudeuten. Tabelle XIX giebt die C.R.L. und die C.R.L.' zwischen den drei chinesischen Serien und den beiden Vertretern der Nesiot. Es zeigt sich in der Tat eine Gruppenverwandtschaft zwischen Tagalen und den "Pooled Prehistorics," während alle anderen Koeffizienten wesentlich grösser als 15 sind.

Zum Vergleich giebt Tabelle XX die andere Seite: nämlich die C.R.L. und die C.R.L.' zwischen Telengeten einerseits und Davidson Blacks Serien sowie den Kham-Tibetanern anderseits. Es kann wohl keinem Zweifel unterliegen, dass hier eine viel breitere Kluft besteht als zwischen den Chinesen und den Nesiot!

TABELLE XIX.

Koeffizienten der Rassenähnlichkeit zwischen Chinesen und Nesiot.

	Philippinen: Tagalen (25·2)	Dajaks (45·5)
Chinesen: "Pooled Prehistorics" (36·5)	3·59 ± ·18 (28)* 2·92 ± ·30 (10)† 12·02 ± ·60‡	7·42 ± ·18 (28) 7·79 ± ·30 (10) 18·33 ± ·44
Chinesen: Peking (78·7)	8·76 ± ·18 (28) 9·83 ± ·30 (10) 22·94 ± ·47	15·41 ± ·18 (28) 16·59 ± ·30 (10) 26·72 ± ·31
Chinesen: Fukien (36·0)	5·16 ± ·17 (30) 6·97 ± ·28 (12) 17·47 ± ·59	7·10 ± ·17 (30) 6·87 ± ·28 (12) 17·72 ± ·43

* Alle Charaktere. † Indices und Winkel. ‡ Reduzierte.

Wenn sich auch bindende Schlüsse nicht ziehen lassen, so deuten die eben mitgeteilten Zahlen doch deutlich dahin, dass die Chinesen enger mit den Nesiot wie mit den zentralasiatischen Völkern verwandt sind. Die Verallgemeinerung von dem einzigen Stamm der Telengeten aus ist vielleicht gewagt; es will aber scheinen, als ob dem Begriff der mongolischen Rasse ein ähnliches Schicksal drohe wie dem der Negritorasse.

TABELLE XX.

Koeffizienten der Rassenähnlichkeit.*

	Kham-Tibetaner (14·5)	Chinesen (Peking) (79·0)	Chinesen: "Pooled Prehistorics" (36·2)
Telengeten (54·6)	19·23 ± ·18 (28)* 31·81 ± ·30 (10)† 83·99 ± ·79‡	65·56 ± ·19 (26) 111·55 ± ·32 (9) 101·08 ± ·29	48·91 ± ·19 (26) 82·63 ± ·32 (9) 112·02 ± ·43

* Alle Charaktere. † Indices und Winkel. ‡ Reduzierte.

Auf der anderen Seite ist es wohl kaum nötig hinzuzufügen, dass der hier vermutete südliche Ursprung des chinesischen Volkes nichts über Wiege und

* Hier sind ausser den in der Haupttabelle gegebenen Werten auch die Winkel des Gesichtsdreiecks verwandt worden; erst nachträglich wurde bemerkt, dass auch Reicher dem Brauch gefolgt war, die Gesichtslänge als Basion-Prosthion zu definieren. Da es hier nur darauf ankam, zu zeigen, das die Koeffizienten sehr hoch sind, wurde auf eine erneute Berechnung verzichtet.

Wanderungen der chinesischen Kultur aussagt. Alles deutet darauf hin, dass diese von Zentralasien aus im Norden des Reiches ihren Eingang fand. Schon die ältesten Quellen wissen aber von umwohnenden Barbaren zu berichten. Das Schauspiel der Übernahme einer fremden Kultur seitens einer physisch von ihren Schöpfern verschiedenen Bevölkerung steht im übrigen keineswegs vereinzelt da!

TABELLE XXI.

Werte von a für 10 *ostasiatische Serien (zwischen denen der* C.R.L. *überall berechnet worden ist).*

	Anzahl der Vergleichungen	Anzahl der wesentlichen Unterschiede ($a>10$)	% wesentlicher Unterschiede	Mittelwert der a's > 10
NB	45	29	64·4	38·6
100 *B/L*	45	27	60·0	75·4
L	45	27	60·0	52·1
NH	41	24	58·5	33·8
S	45	26	57·8	31·0
100 *NB/NH*	41	21	51·2	51·1
G'H	45	22	48·9	61·1*
U	45	20	44·4	28·0
Q'	45	19	42·2	36·2
O_1	44	18	40·9	33·1
B	45	18	40·0	23·7
Oc. I.	36	14	38·9	27·7
100 *B/H'*	44	16	36·4	28·9
H'	44	16	36·4	27·3†
100 *G'H/GB*	45	16	35·6	34·6
LB	45	15	33·3	36·3
P∠	41	13	31·7	18·2
O_2	45	12	26·7	19·8
B'	45	11	24·4	22·5
J	45	10	22·2	82·3‡
fmb	45	10	22·2	20·4§
N∠	28	6	21·4	12·5
100 *H'/L*	44	9	20·5	14·4
fml	45	9	20·0	29·8‖
G_2	36	7	19·4	17·6¶
100 O_2/O_1	44	8	18·2	14·6
G_1	45	5	11·1	18·0**
A∠	28	3	10·7	12·6††
100 *fmb/fml*	45	0	0·0	—
100 G_2/G_1	36	0	0·0	—
C	3	0	0·0	—

* Alle wes. Untersch. mit And. u. Nord- oder Südchin.
† Alle wes. Untersch. mit Jap. oder And., ausser 10·40 zwischen Java $B+B$, und Fukien.
‡ 9 wes. Untersch. mit And., 10·09 zwischen Java $B+B$ und Java, Mittel u. Ost.
§ 9 wes. Untersch. mit And., 11·59 zwischen Birma. A und Java $B+B$.
‖ 8 wes. Untersch. mit And., 12·26 zwischen Birma. A und Aëtas.
¶ 6 wes. Untersch. mit And., 11·68 zwischen Birma. A und Aëtas.
** Alle wes. Untersch. mit And.
†† Alle wes. Untersch. mit Java $B+B$ (grösster Wert 13·71).

Es ist wünschenswert sich zum Schluss Rechenschaft darüber zu geben, welche Rolle die einzelnen Merkmale für die Unterscheidung der hier betrachteten Rassen spielen. Tabelle XXI giebt darüber Auskunft. Ganz allgemein gesprochen, sind der Naseneingang und der horizontale Aufriss des Schädels (*S* ist eng mit *L* correliert!) die wichtigsten, und es verdient hervorgehoben zu werden, dass in dem hier betrachteten Gebiet die Schädellänge mehr als die Breite variiert. Auf der anderen Seite zeigen Foramen magnum, Gaumen und Jochbogenbreite nur recht geringe Unterschiede, besonders wenn man von den Andamanesen absieht.

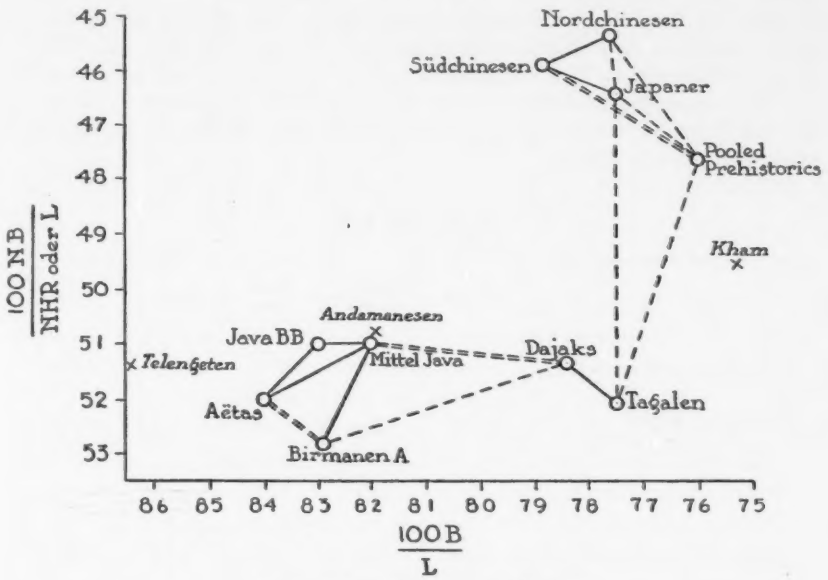


Fig. 1. Schema der Rassengruppierung:
Reduzierte C.R.L.'s; 0—8 ————————
unwesentlich >8 = = = = = =
wesentlich >8—15 – – – – – –

N.B. $\frac{100\,NB}{NHR\ oder\ L}$ ist nicht gegeben für Harrowers Südchinesen und für Japaner. Der Wert wurde ermittelt durch $\frac{100\,NB}{NH} = \frac{100\,NB}{NH'} - 2{\cdot}4$. 2·4 ist der gewogene Mittelwert des Unterschiedes der beiden Indices bei Tagalen, Aëtas, und den beiden Serien aus Java.

Diese Ergebnisse lassen sich zum Zweck einer bildlichen Darstellung der hier erreichten Rasseneinteilung verwenden: das Schema giebt den Nasenindex als die eine, und den Schädelindex als die andere Koordinate an; die Verbindungslinien sind in der Figur 1 erklärt. Man sieht, dass diese beiden Merkmale hier zwar zu einer groben Anordnung hinreichen, die verschiedenen und verschiedenartigen Verbindungslinien oder deren Fehlen zeigen aber anderseits, dass das Herausarbeiten von Einzelheiten nur mittels feinerer Methoden gelingt!

ANHANG I.

KONTUREN.

Das wichtigste über die Technik der Konturen ist bereits im Text gesagt. Die Konstruktion im einzelnen geht aus den eingezeichneten Koordinaten wohl zur Genüge hervor. Bei den ersten Serien wurde das Inion und der Bogen über der Glabella-Inion Linie mit bestimmt. Als Inion war damals der Vereinigungspunkt der beiden Liniae nuchae supremae angenommen, ein Punkt der fast konstant an die Basis der Protuberantia occipitalis fiel. Das ist aber genau die Stelle, worauf er nach Martin nicht fallen darf. Es war mir nicht möglich, eine klare Definition des Inion zu erhalten und so schien es mir am sichersten, um weitere Verwirrung zu vermeiden, den Punkt gänzlich wegzulassen. Einige der an den Typenkonturen abgenommenen Indices und Winkel stellen wir noch zusammen (Tabelle XXII).

TABELLE XXII.

	Dajaks	Bantam-Batavia	Mittel-Java	Tagalen	Aëtas
Stirnneigungswinkel ($\angle \beta N\gamma$)	51°·0	50°·9	52°·2	51°·2	51°·7
For. magn. Winkel (zw. Bas.-Op. u. $N\gamma$)	6°·0	2°·5	7°·0	8°·0	7°·5
Index der Stirnwölbung*	19·6	18·1	17·7	20·5	19·5
"Index of frontal flattening"†	10·8	10·2	9·9	11·3	11·0

* $100 \times \frac{\frac{1}{2}(TR_x + TL_x)}{TR_y + TL_y}$. † $100 \times \frac{\frac{1}{2}(TR_x + TL_x)}{FO}$.

TABELLE XXIII. *Transversale Konturen.*

	Dajaks (30)	Bantam-Batavia (53)	Mittel-Java (30)	Tagalen (29)	Aëtas (30)
MA	113·6	113·8	115·1	116·8	116·0
I *R*	58·3	59·4	61·3	57·5	59·3
I *L*	58·8	57·4	59·9	56·9	58·5
II *R*	62·5	64·0	66·1	62·3	63·9
II *L*	62·9	61·6	61·5	61·7	63·9
III *R*	64·7	66·9	69·5	65·3	68·5
III *L*	65·8	64·8	65·0	64·2	66·8
IV *R*	66·1	69·3 (51)	71·9	67·6	71·2
IV *L*	67·8	66·9	67·6	66·3	69·2
V *R*	66·2	69·9	72·1	67·7	71·5
	68·0	67·3	68·0	66·6	69·5
	65·2	68·9 (52)	71·0	67·2	70·7
VI *L*	67·0	66·5	67·2	66·0	68·8
VII *R*	63·4	67·0	68·9	65·6	69·1
VII *L*	65·1	64·2	65·5	64·2	67·1
VIII *R*	59·3	62·9	64·4	61·3	65·1
VIII *L*	61·2	59·8	60·8	59·7	62·9
IX *R*	50·5	54·1	55·4	52·0	55·3
IX *L*	52·6	51·2	52·1	50·6	53·8
X *R*	35·5	38·2	39·6	36·4	38·5
X *L*	37·4	35·6	36·1	35·7	37·5
$A\frac{1}{4}$ *R*	17·8	19·5	21·0	18·4	18·6
$A\frac{1}{4}$ *L*	19·1	17·4	17·9	18·2	18·4
ZR R x	3·6	3·1	3·2	4·0	3·9
y	61·9	62·9	65·1	61·1	63·3
ZR L x	2·9	3·7	3·8	4·2	3·9
y	62·5	60·9	60·5	61·3	62·7

TABELLE XXIV. *Horizontale Konturen.*

	Dajaks (30)	Bantam-Batavia (54)	Mittel-Java (30)	Tagalen (29)	Aëtas (30)
FO	172·2	168·6	170·6	176·6	169·3
$F\frac{1}{4}$ *R*	22·4	23·8	23·1	23·8	23·6
$F\frac{1}{4}$ *L*	21·9	23·9	22·5	24·2	22·5
$F\frac{1}{2}$ *R*	35·4	36·5	37·9	34·8	34·8
$F\frac{1}{2}$ *L*	35·0	37·2	38·1	35·8	35·0
II *R*	46·1	46·5	47·3	46·3	46·8
II *L*	45·7	46·6	47·3	46·4	46·2
$II\frac{1}{2}$ *R*	46·8	46·4	46·8	47·3	47·1
$II\frac{1}{2}$ *L*	46·5	46·3	46·9	47·4	47·3
III *R*	48·3	48·2	49·0	48·4	48·9
III *L*	47·8	48·1	49·1	48·1	48·9
IV *R*	53·9	54·9	56·0	53·4	56·1
IV *L*	53·7	54·4	56·1	54·1	53·9
V *R*	62·8	62·8	64·3	62·5	64·9
V *L*	61·6	63·2	63·9	62·1	64·6
VI *R*	67·7	68·1	69·4	67·7	69·8
VI *L*	66·1	68·1	68·7	66·7	70·4
VII *R*	68·8	69·7	70·2	68·7	70·5
VII *L*	67·0	69·5	69·9	67·6	71·8
VIII *R*	65·3	66·5	66·5	65·5	66·5
VIII *L*	64·0	66·2	66·9	64·1	68·6
IX *R*	57·2	59·7	59·6	57·9	59·0
IX *L*	57·6	58·7	59·4	57·6	60·7
X *R*	43·5	46·9	47·0	44·1	46·3
X *L*	46·3	45·7	46·4	45·3	47·9
$O\frac{1}{4}$ *R*	25·1	28·9	28·4	25·5	26·7
$O\frac{1}{4}$ *L*	27·7	26·7	27·8	26·4	28·1
TR R x	18·6	17·5	16·2	20·2	18·1
y	47·6	47·6	48·1	48·9	47·8
TR L x	18·6	16·8	17·7	19·6	19·2
y	47·3	47·2	47·9	48·2	47·7

TABELLE XXV.

Sagittale Konturen.

	Dajaks (30)	Bantam-Batavia (54)	Mittel-Java (30)	Tagalen (29)	Aëtas (30)
N	170·9 (30)	165·1 (54)	167·0 (30)	174·1 (29)	165·3 (30)
über *N O*	27·8 „	25·4 „	29·6 „	31·4 „	28·3 „
$N\frac{1}{4}$	42·7 „	41·5 „	43·8 „	47·2 „	42·2 „
1	60·5 „	59·3 „	61·0 „	64·2 „	61·9 „
2	72·7 „	71·9 „	73·6 „	76·4 „	74·8 „
3	80·3 „	78·9 „	81·4 „	84·6 „	83·0 „
4	84·9 „	84·6 „	85·6 „	88·8 „	88·0 „
5	87·0 „	87·0 „	88·0 „	90·6 „	89·6 „
6	87·1 „	87·5 „	88·1 „	90·3 „	89·9 „
7	83·9 „	84·4 „	85·1 „	87·0 „	87·1 „
8	75·9 „	77·2 „	77·5 „	79·3 „	80·0 „
9	60·4 „	61·7 „	61·5 „	63·2 „	65·5 „
$\gamma\frac{1}{4}$	34·9 „	38·3 „	36·0 „	36·3 „	42·9 „
$\gamma\frac{1}{2}$	28·5 „	30·5 „	27·5 „	29·3 „	37·2 „
unter *N* 1	55·0 „	55·0 „	54·7 „	54·6 (26)	54·8 (26)
2	52·9 „	53·1 „	53·4 „	52·4 „	52·4 „
8	46·5 „	46·5 „	45·6 „	46·3 (28)	45·4 (30)
9	36·8 „	35·2 „	33·6 „	35·5 (29)	33·7 „
$\gamma\frac{1}{2}$	24·2 „	26·8 „	26·3 „	28·7 „	25·8 „
$\gamma\frac{1}{4}$	17·1 „	18·2 „	17·9 „	20·3 „	19·0 „
Glab. *x*	3·1 „	2·2 „	3·3 „	3·1 „	3·1 „
y	10·2 „	10·6 „	11·1 „	10·0 „	11·0 „
β *x*	68·6 „	69·0 „	66·3 „	71·3 „	69·5 „
y	84·6 „	84·9 „	85·6 „	88·6 „	88·0 „
V. *x*	95·3 „	92·5 „	91·7 „	91·1 „	91·3 „
y	88·1 „	88·0 „	89·0 „	93·7 „	90·3 „
λ *x*	4·5 „	3·8 „	4·0 „	3·7 „	2·5 „
y	34·5 „	34·6 „	35·7 „	33·2 „	36·4 „
Oc. P. *x*	1·0 „	1·0 „	0·8 „	1·1 „	1·6 „
y	10·1 „	10·2 „	6·7 „	10·3 „	14·2 „
*p** *x*	34·6 (27)	35·3 „	34·6 „	32·9 (25)	33·6 (26)
y	17·0 „	16·2 „	16·8 „	17·9 „	17·0 „
p' *x*	43·9 (30)	43·7 „	42·2 „	43·5 (26)	42·7 „
y	51·4 „	52·7 „	52·0 „	49·0 „	50·4 „
Bas. von *N*	99·7 „	97·2 „	98·2 „	100·3 (24)	79·8 (28)†
von γ	97·1 „	94·1 „	93·5 „	97·3 „	45·3 „ †
Alv. P. von *Bas.*	95·2 (27)	94·9 (53)	95·9 „	95·7 „	92·9 (25)
von *N*	70·3 „	69·8 „	70·7 „	70·7 „	70·0 „
Pm. (*Prosth.*) *x*	7·9 „	10·5 „	9·4 „	6·7 (22)	6·8 (26)
y	66·6 „	66·6 „	67·3 „	67·6 „	65·6 „
N. S. *x*	5·6 (29)	6·2 „	6·0 „	3·2 (23)	3·3 „
y	51·7 „	51·0 „	52·5 „	49·6 „	51·0 „
Sub-orb. *x*	9·6 „	7·8 (54)	7·4 „	9·5 (29)	9·2 (29)
y	26·1 „	26·4 „	26·2 „	26·6 „	25·8 „
Sph. *x*	67·4 (30)	62·2 „	62·9 „	65·8 „	63·0 (28)
y	32·4 „	32·1 „	32·7 „	31·5 „	31·1 „
Aur. P. *x*	86·4 (29)	81·3 „	83·0 „	87·1 „	81·2 (29)
y	24·8 „	26·3 „	25·7 „	25·3 „	25·3 „
Op. *x*	47·8 (30)	45·0 (53)	45·7 „	49·6 (26)	43·9 „
y	51·9 „	49·7 „	50·4 „	51·7 „	49·6 „
NL	22·2 „	22·8 (54)	23·1 „	20·1 „	21·2 (30)
NL'	20·3 „	21·2 „	20·6 „	19·2 „	20·0 „
$\angle LN\gamma$	113°·2 „	113°·1 „	113°·4 „	108°·3 „	111°·5 „
Front. Bog. *x* von *N*	50·1 „	49·3 „	47·6 „	52·1 (29)	51·5 „
y	25·5 „	25·3 „	25·3 „	27·7 „	25·8 „
Oc. Bog. *x* von λ	57·4 „	54·6 (53)	52·6 „	54·1 (26)	54·7 (29)
y	25·4 „	23·7 „	24·1 „	25·7 „	23·7 „

* *x* vom *Alv. P.*, *y* von der Parallelen zu $N\gamma$ durch *Alv. P.*

† *x* von γ, *y* von $N\gamma$.

		Nr.	*L*	*F*	*B*	*H'*	*H*	*OH*	*LB*	*B'*	*U*	*Gl.U*	*Q'*	*βQ'*	S_1'	S_2'	S_3'	S_1	S_2	S_3
AETAS	TAGALEN	397	181·0	180·0	141·0	142·0	143·0	120·0	104·0	91·8	510·0	516·0	327·0	322·0	115·8	118·0	99·5	129·0	132·0	114·0
		400	190·0	187·5	141·0	—	—	116·0	—	96·0	530·0	535·0	318·0	317·0	114·3	123·0	—	135·0	145·0	—
		403	172·5	170·0	134·0	135·0	137·0	119·0	98·5	98·0	491·0	496·0	314·0	312·0	109·0	110·2	—	124·0	126·0	—
		419	176·5	176·0	129·0	137·5	138·5	115·0	103·0	95·0	500·0	506·0	304·0	304·0	113·0	111·2	91·3	127·0	128·5	110·0
		427	184·5	185·0	144·0	136·5	—	—	99·0	97·3	524·0	526·0	322·0	—	116·0	118·0	98·0	136·0	135·0	116·0
		428	176·0	176·5	139·0	143·5	142·5	120·0	102·0	108·5	506·0	508·0	323·0	324·0	117·0	123·0	85·0	138·0	145·0	97·0
		429	180·0	178·5	141·5	134·5	135·5	117·5	97·0	91·3	514·0	517·0	326·0	323·0	115·0	118·5	95·0	131·0	137·0	113·0
		431	177·0	171·5	141·0	137·0	139·5	119·5	96·0	83·0	502·0	507·0	319·0	318·0	116·0	115·5	102·5	126·5	134·0	120·0
		434	177·0	178·0	137·0	136·0	136·0	110·0	101·5	97·0	506·0	508·0	313·0	312·0	114·0	104·8	99·0	134·0	115·0	113·0
		435	181·0	181·5	144·0	—	—	116·0	—	101·0	522·0	527·0	323·0	323·0	117·5	108·3	99·6	133·5	122·0	117·5
		436	176·0	175·5	139·0	131·0	130·0	111·0	106·8	96·0	498·0	504·0	310·0	309·0	119·7	99·4	91·3	139·0	112·0	108·0
		437	183·0	181·0	136·5	133·5?	135·0	114·0	—	98·7	515·0	518·0	311·0	310·0	112·6	113·0	106·0	130·5	121·5	123·0
		440	183·0	184·0	138·0	—	—	116·0	—	95·7	517·0	516·0	314·0	311·0	113·8	118·6	97·2	133·0	134·0	113·0
		443	185·0	181·5	135·0	—	—	119·5	—	93·3	514·0	520·0	322·0	320·0	121·0	111·4	—	141·5	125·0	—
		575	170·0	171·5	133·0	134·0	136·0	111·0	98·2	92·0	485·0	487·0	300·0	297·0	110·8	108·0	97·3	127·0	121·0	114·0
		577	183·0	178·0	144·0	139·0	—	—	105·2	92·4	514·0	520·0	—	328·0	110·5	116·0	99·8	125·0	136·0	115·0
		580	178·0	180·0	137·5	134·0	136·0	116·5	102·3	98·8	506·0	510·0	320·0	317·0	112·0	112·6	93·0	131·0	130·0	109·0
		583	176·0	176·5	139·0	138·5	139·0	119·0	95·0	92·0	505·0	506·0	324·0	324·0	115·3	119·0	92·6	134·0	136·0	109·0
		584	176·0	175·5	139·0	130·5	132·0	114·5	102·4	94·5	500·0	501·0	311·0	311·0	115·0	109·8	92·8	130·0	122·0	106·0
		585	173·0	170·0	143·5	139·0	139·0	119·0	103·3	96·0	502·0	504·0	326·0	320·0	110·8	119·6	92·8	123·0	139·5	104·0
		586	182·0	177·0	140·0	138·0	140·0	116·0	103·3	90·0	505·0	511·0	315·0	312·0	111·0	117·0	103·0	127·0	133·0	116·0
		588	173·0	175·5	142·0	136·0	137·5	119·0	93·0	97·0	504·0	504·0	329·0	325·0	112·0	120·8	96·4	132·5	138·0	114·0
		590	181·0	178·5	144·5	140·5	143·5	120·0	101·0	87·8	515·0	516·0	318·0	317·0	115·0	119·8	97·2	130·0	138·5	112·5
		592	177·5	177·5	135·0	138·5	136·5	114·0	102·0	91·7	500·0	503·0	313·0	313·0	108·2	120·6	98·0	125·0	126·0	115·0
		594	187·0	184·0	137·0	142·0	143·0	118·0	102·0	93·0	526·0	531·0	322·0	321·0	109·2	113·4	112·5	125·0	123·0	137·0
		595	173·5	175·0	138·0	136·0	139·0	115·0	104·9	92·2	—	—	311·0	308·0	113·2	107·5	94·3	128·0	122·0	113·0
		596	178·5	179·5	140·0	—	—	121·0	—	90·7	509·0	513·0	323·0	324·0	118·0	116·0	—	136·0	130·0	—
		597	174·0	177·0	133·0	135·0	135·0	114·5	98·0	93·0	489·0	491·0	311·0	310·0	111·0	110·7	96·8	130·0	126·0	118·0
		603	182·5	181·0	137·0	137·0	137·0	116·0	103·7	91·0	506·0	515·0	311·0	311·0	116·8	114·9	98·9	131·0	127·0	121·0
		607	183·0	182·0	141·0	141·0	144·0	121·0	99·5	91·3	512·0	514·0	322·0	320·0	118·2	120·0	97·0	135·0	141·0	117·0
		609	184·5	183·0	140·5	140·0	139·0	118·0	96·0	95·0	521·0	524·0	323·0	321·0	117·3	103·8	113·2	136·0	110·0	141·0
	WEIBLICH	399	165·0	165·0	130·0	125·5	126·0	101·5	95·3	86·7	471·0	475·0	279·0	278·0	106·2	94·5	95·0	120·0	104·0	112·0
		422	167·0	169·5	130·5	137·0	138·0	117·5	93·0	90·4	480·0	481·0	313·0	310·0	112·0	110·3	96·6	129·0	126·0	110·0
		423	167·0	168·0	133·0	134·5	137·5	117·5	91·5	85·0	481·0	482·0	315·0	306·0	106·0	113·2	93·3	121·0	131·0	107·0
		438	169·0	173·0	132·5	130·0	132·0	110·5	92·8	99·2	484·0	485·0	305·0	304·0	108·0	111·2	93·4	125·0	127·0	113·0
		439	172·0	173·0	134·0	137·0	137·5	117·0	98·6	95·6	491·0	491·0	315·0	312·0	112·2	113·0	95·4	131·0	127·0	109·0
		573	164·5	165·5	130·0	136·0	138·0	111·0	97·2	87·8	471·0	471·0	300·0	300·0	105·8	108·0	89·2	122·0	125·0	101·0
		587	168·0	169·5	132·0	129·5	131·5	109·5	93·5	90·1	484·0	484·0	297·0	294·0	108·2	104·0	95·3	125·0	115·0	112·0
		589	169·5	169·5	135·5	—	—	108·5	—	88·0	484·0	485·0	304·0	300·0	106·2	108·0	94·8	121·5	121·5	111·0
		591	172·0	172·0	131·0	133·0	134·0	114·0	90·0	89·7	483·0	488·0	309·0	302·0	106·3	115·2	96·5	122·0	132·0	112·0
		598	170·0	170·0	132·0	128·0	129·0	114·0	94·2	86·0	482·0	485·0	310·0	304·0	107·3	108·3	97·2	122·0	122·0	112·0
		599	171·0	172·0	129·0	132·0	135·0	114·0	92·3	84·6	483·0	485·0	301·0	298·0	111·2	107·0	97·6	130·0	122·0	114·0
		600	172·0	174·0	127·0	128·0	127·0	110·0	98·8	90·4	478·0	480·0	296·0	296·0	109·8	109·0	86·3	126·0	124·0	100·0
		602	164·0	165·0	137·0	131·0	130·0	109·0	91·6	91·0	476·0	479·0	304·0	296·0	107·5	97·0	102·2	125·0	107·0	118·0
		605	166·0	167·0	135·0	—	—	113·0	—	90·6	480·0	482·0	311·0	308·0	107·2	104·8	—	124·0	115·0	—
		606	178·0	177·5	127·0	132·0	134·0	111·0	102·0	90·7	488·0	492·0	300·0	300·0	106·3	107·8	104·0	122·0	118·0	121·0
		608	171·0	170·0	131·0	126·5	126·0	104·5	92·2	87·6	483·0	483·0	291·0	294·0	108·3	107·8	92·1	122·0	117·0	106·0
		610	169·0	166·5	131·0	137·0	—	—	96·6	87·2	479·0	483·0	—	300·0	121·0	95·2	98·0	140·0	104·0	109·0
		611	177·0	175·5	137·0	128·0	129·0	110·5	96·8	96·2	511·0	513·0	310·0	308·0	115·0	110·7	95·3	134·5	124·0	107·5
		593	169·0	170·0	130·0	127·0	128·0	109·0	87·9	85·0	480·0	482·0	299·0	297·0	106·2	109·0	99·0	121·0	122·0	120·0
	MÄNNLICH	387	178·0	178·0	141·0	140·0	139·0	116·5	102·5	93·9	507·0	508·0	322·0	320·0	111·0	114·0	96·8	125·0	128·0	111·5
		401	170·0	167·0	140·0	136·0	137·0	120·0	96·0	90·0	489·0	493·0	328·0	322·0	114·0	102·0	104·2	130·0	112·0	117·0
		405	170·0	170·5	145·0	132·0	135·0	119·0	99·3	92·4	500·0	503·0	326·0	314·0	105·5	115·0	96·0	116·0	132·0	108·0
		406	166·0	166·0	143·0	135·0	136·0	118·0	95·0	101·0	492·0	494·0	323·0	319·0	111·0	104·0	98·6	126·0	115·0	115·0
		410	178·0	174·0	151·0	140·0	143·0	121·0	99·1	98·0	523·0	523·0	332·0	325·0	117·0	111·0	99·3	131·0	125·0	111·0
		411	177·0	174·0	149·0	138·0	138·0	115·5	106·0	94·0	515·0	525·0	330·0	328·0	115·0	102·0	93·2	132·0	114·0	111·0
		412	178·0	179·0	141·0	137·0	140·0	117·5	101·3	97·0	510·0	510·0	322·0	322·0	114·0	112·5	94·2	128·0	129·0	110·0
		413	178·0	176·0	146·0	142·0	142·5	119·0	103·4	92·0	510·0	515·0	330·0	325·0	117·0	118·0	92·0	132·0	136·0	105·0
		424	166·0	166·0	146·0	—	—	115·0	—	96·0	490·0	494·0	327·0	321·0	111·0	101·0	95·0	122·0	115·0	109·0
		425	168·0	168·0	145·0	145·0	145·0	118·0	98·0	89·9	491·0	495·0	320·0	317·0	117·0	104·0	99·0	131·0	117·0	112·0
		433	179·0	176·0	143·0	131·0	133·0	115·5	101·0	94·6	508·0	513·0	326·0	320·0	120·0	101·0	97·0	136·0	112·0	117·0
		444	173·0	173·0	141·0	144·0	145·0	122·0	100·2	94·0	502·0	507·0	330·0	328·0	117·3	115·0	93·0	133·0	134·0	107·0
		514	175·0	173·0	136·0	126·0	123·0	102·0	99·8	93·8	490·0	494·0	297·0	299·0	114·2	95·6	90·8	133·0	102·0	116·0
		515	182·0	181·0	149·0	150·0	148·0	122·0	100·2	95·7	520·0	523·0	343·0	340·0	120·8	118·2	100·3	138·0	131·0	116·0
		517	163·0	164·0	147·0	139·0	138·0	117·0	100·0	93·3	495·0	495·0	324·0	321·0	111·0	106·6	90·0	127·0	123·0	102·0
		519	165·0	164·0	144·5	135·0	132·0	115·0	97·4	87·0	470·0	473·0	324·0	314·0	108·2	103·0	98·5	122·0	113·0	113·5
		520	168·0	167·0	144·0	130·0	128·0	111·0	98·0	102·8	483·0	485·0	318·0	316·0	108·2	103·0	94·2	126·0	114·0	106·0
		521	168·0	168·0	136·0	—	—	112·0	—	89·1	469·0	474·0	314·0	309·0	109·2	103·0	97·8	122·0	113·0	113·0
		522	167·0	166·0	147·0	138·0	140·0	119·0	97·4	88·8	497·0	497·0	341·0	32[illegible]·0	106·0	106·0	93·2	132·0	122·0	105·0
		527	171·0	167·0	144·0	126·0	128·0	113·0	92·2	91·8	498·0	503·0	[illegible]21·0	318·0	104·7	114·0	91·8	119·0	131·0	105·0
		529	166·0	164·5	139·0	132·0	133·0	110·0	96·5	94·6	488·0	492·0	314·0	310·0	105·8	103·0	96·0	120·0	119·0	110·0
		530	164·0	164·0	138·0	131·0	132·0	113·0	92·0	90·3	477·0	478·0	314·0	308·0	108·2	108·0	95·0	122·0	124·0	108·0
		531	165·5	167·0	140·0	131·0	132·5	114·5	96·0	87·7	482·0	485·0	321·0	314·0	112·0	108·3	87·7	129·0	126·0	100·0
		533	166·0	168·0	146·0	136·0	137·0	117·0	94·1	90·0	494·0	496·0	333·0	333·0	117·6	104·0	94·0	136·0	121·0	109·0
		534	181·0	181·5	147·0	143·0	144·0	123·0	103·3	94·3	520·0	522·0	334·0	333·0	118·6	118·4	95·2	134·0	134·0	114·0
		535	170·0	168·0	137·0	131·0	133·0	113·0	98·3	86·0	483·0	488·0	312·0	305·0	106·9	103·6	97·0	120·0	119·0	115·0
		536	173·5	171·0	143·0	135·0	136·0	114·5	99·2	92·3	499·0	503·0	321·0	315·0	109·0	104·7	98·6	123·0	117·0	112·0
		538	176·5	178·0	146·5	145·0	144·5	121·0	101·0	96·2	516·0	518·0	335·0	330·0	120·3	116·0	101·0	136·0	130·0	119·0
		540	166·0	166·0	145·0	133·0	135·0	115·0	91·5	84·2	488·0	490·0	318·0	315·0	112·6	104·0	92·2	126·0	118·0	112·0
		541	167·0	168·0	141·0	—	—	113·0	—	88·0	488·0	487·0	320·0	309·0	110·6	106·2	—	127·0	122·0	—
		542	171·5	168·0	145·0	139·5	142·5	120·0	102·0	101·3	499·0	502·0	334·0	326·0	113·2	108·7	97·0	127·0	128·0	110·0
		543	169·0	170·5	146·0	129·0	130·0	111·0	96·0	93·0	499·0	500·0	314·0	307·0	105·0	109·0	—	115·0	125·0	—
		[illegible]	167·0	162·0	145·0	—	—	111·0	—	88·0	487·0	490·0	314·0	311·0	110·0	101·0	95·0	125·0	115·0	105·0

S_2	S_3	S	*fml*	*fmb*	*G'H*	*J*	*GB*	*GL*	*PH*	*NHR*	*NHL*	*NH'*	*NB*	*SC*	*SS*	*DC*	*DS*	*DA*	O_1R	$O_1'R$	*Laer.* O_1R
132·0	114·0	375·0	36·9	31·5	70·2	136·0	111·6	97·7	21·3	51·0	52·9	48·2	28·2	11·3	4·5	23·7	8·1	33·0	46·3	43·2	41·0
145·0	—	—	—	—	68·0	134·5	94·8	—	16·0	54·0	54·0	52·8	26·5	10·8	3·0	—	—	—	43·8	39·5	—
126·0	—	—	—	—	72·0	123·5	90·0	98·8	—	52·1	53·1	50·5	27·9	13·0	4·8	—	—	—	39·5	—	—
128·5	110·0	365·5	36·0	31·1	72·3	134·5	106·8	95·3	21·0	56·1	56·1	50·0	27·3	11·2	3·4	23·2	9·2	31·0	43·5	39·4	—
135·0	116·0	387·0	—	—	—	—	—	—	—	—	—	—	—	6·8	3·0	—	—	—	45·1	—	—
145·0	97·0	380·0	36·0	30·4	69·0	133·5	97·8	99·3	18·3	50·5	50·5	50·1	24·2	7·8	2·0	28·0	10·0	34·0	43·2	40·7	38·3
137·0	113·0	381·0	35·0	30·0	69·8	130·0	105·2	97·0	19·4	51·2	54·0	48·5	27·8	9·0	2·0	25·0	10·5	36·0	42·8	39·3	—
134·0	120·0	380·5	34·1	30·1	71·3	—	—	89·0	18·6	52·5	53·0	51·7	24·2	8·8	4·3	18·0	12·0	31·0	—	—	—
115·0	113·0	363·0	38·0	31·4	72·5	—	102·0	101·0	—	56·8	56·0	—	—	—	—	—	—	—	—	—	—
122·0	117·5	373·0	—	—	—	—	101·0	—	—	—	—	53·2	30·2	10·0	3·0	—	—	—	45·6	—	—
112·0	108·0	359·0	27·5	30·9	70·0	137·5	101·3	103·8	18·2	55·6	55·6	51·1	29·6	9·0	2·0	24·1	7·0	29·0	43·4	41·0	38·9
121·5	123·0	375·0	38·2	26·4	65·8	—	—	91·0	—	53·5	53·8	46·0	28·0	10·0	3·4	23·8	8·0	29·5	41·3	39·7	38·4
134·0	113·0	380·0	—	—	65·2	127·5	94·7	—	—	47·2	47·9	45·7	27·0	10·6	2·0	—	—	—	40·0	37·0	—
125·0	—	—	—	—	68·5	132·0	94·8	—	16·7	53·0	53·0	51·6	—	—	—	—	—	—	43·4	—	39·1
121·0	114·0	362·0	34·0	27·5	69·0	—	—	95·2	20·3	49·9	51·2	48·9	27·0	9·0	3·6	22·2	8·2	28·5	—	—	—
136·0	115·0	376·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
130·0	109·0	370·0	35·5	27·5	76·2	134·0	105·3	104·0	19·5	56·0	56·5	53·1	27·0	10·1	3·0	—	—	—	44·0	—	—
136·0	109·0	379·0	39·0	31·0	62·9	129·5	92·4	88·2	16·0	49·8	45·1	45·5	26·9	6·3	2·5	21·6	8·4	30·5	41·7	38·2	38·2
122·0	106·0	358·0	35·7	—	76·0	130·0	102·0	100·8	—	55·1	56·5	—	27·2	12·0	3·4	23·6	9·9	31·0	43·0	41·0	39·8
139·5	104·0	366·5	36·0	33·6	67·7	137·5	98·0	102·5	15·3	54·5	56·0	51·4	29·8	9·9	4·5	22·0	9·8	31·0	44·0	42·0	40·3
133·0	116·0	376·0	37·2	31·9	72·3	130·0	100·0	96·9	23·6	50·5	50·8	47·9	26·0	8·0	3·0	20·0	6·1	26·0	41·2	38·6	37·0
138·0	114·0	384·5	33·9	27·9	66·0	125·0	92·2	90·0	18·8	47·0	47·0	47·0	22·0	6·2	2·8	23·1	7·6	28·5	41·8	38·0	38·0
138·5	112·5	381·0	34·2	25·8	70·0	138·0	106·3	94·8	19·0	54·8	54·1	50·3	30·8	10·2	4·3	23·0	9·0	31·5	44·2	41·0	40·7
126·0	115·0	366·0	36·5	31·2	—	127·0	—	—	—	52·2	53·3	49·6	—	10·9	4·1	—	—	—	43·5	—	—
123·0	137·0	385·0	35·0	31·0	73·6	140·0	110·0	99·6	23·0	55·2	55·6	49·7	28·1	11·0	3·2	—	—	—	43·2	—	—
122·0	113·0	363·0	33·7	28·0	76·0	—	100·1	106·0	19·5	60·7	60·7	54·5	30·6	9·2	3·5	—	—	—	46·2	—	—
130·0	—	—	—	—	67·2	136·0	107·2	—	17·0	51·3	52·0	49·3	29·0	8·6	3·0	—	—	—	42·8	—	39·9
126·0	118·0	374·0	35·0	25·3	68·0	122·0	91·0	91·8	19·0	54·0	53·8	49·4	27·8	8·5	3·6	—	—	—	43·0	—	38·6
127·0	121·0	379·0	36·2	29·2	71·3	140·5	101·3	97·5	15·0	57·5	57·5	55·6	29·0	11·8	4·1	—	—	—	43·0	—	—
141·0	117·0	393·0	36·4	28·0	—	122·5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
110·0	141·0	387·0	35·6	30·5	68·0	128·5	95·0	85·0	19·8	51·5	51·0	48·8	29·6	8·1	5·3	20·0	9·2	29·0	44·0	42·0	39·5
104·0	112·0	336·0	35·0	28·0	67·2	124·5	94·0	93·1	17·0	49·3	49·8	49·1	26·0	7·9	3·0	—	—	—	41·8	—	—
126·0	110·0	365·0	32·6	26·8	63·1	121·5	94·2	88·6	17·0	48·4	48·4	45·3	28·0	—	—	—	—	—	41·4	—	—
131·0	107·0	359·0	35·0	27·5	60·0	120·0	95·0	88·0	15·0	46·9	46·8	44·1	26·1	5·6	—	21·2	6·8	27·0	39·4	37·2	37·2
127·0	113·0	365·0	—	26·5	68·5	122·0	95·2	—	20·0	48·1	48·8	47·9	29·5	14·5	4·6	22·6	8·0	28·5	40·5	37·5	36·0
127·0	109·0	367·0	32·0	27·5	67·6	119·5	98·2	99·0	22·0	45·8	48·0	45·8	27·6	9·4	2·7	—	—	—	41·9	—	—
125·0	101·0	348·0	35·5	28·0	58·4	130·0	101·0	97·2	14·6	46·4	46·6	43·7	28·7	9·0	2·0	—	—	—	40·0	—	—
115·0	112·0	352·0	33·2	27·9	65·6	121·5	89·0	88·4	18·0	47·9	48·8	47·0	23·0	6·4	2·2	18·1	7·8	24·0	40·0	36·2	35·5
121·5	111·0	354·0	—	—	62·2	114·0	—	—	—	49·0	49·0	—	25·0	—	—	—	—	—	—	—	—
132·0	112·0	366·0	33·4	26·6	64·0	125·0	96·2	85·6	14·5	48·0	48·0	48·0	22·1	6·0	2·3	20·0	8·5	27·0	38·1	36·3	34·4
122·0	112·0	356·0	33·1	26·7	61·9	124·0	102·0	95·0	18·0	50·0	48·1	43·0	27·5	—	—	—	—	—	40·4	—	—
122·0	114·0	366·0	33·9	26·0	63·2	—	90·0	83·0	13·0	—	—	—	—	—	—	—	—	—	41·0	—	—
124·0	100·0	350·0	35·0	28·9	68·0	120·5	95·0	90·9	18·3	51·0	51·5	49·0	24·0	8·0	4·1	—	—	—	41·2	38·9	36·9
107·0	118·0	350·0	34·0	27·0	63·0	126·5	91·3	84·0	14·0	48·9	49·2	49·1	24·5	—	—	—	—	—	40·0	—	—
115·0	—	—	—	—	63·8	124·0	96·2	—	17·1	47·6	46·6	45·9	26·0	12·1	3·1	—	—	—	39·9	—	—
118·0	121·0	361·0	35·0	28·1	71·3	114·0	91·0	97·8	17·8	53·5	53·2	53·2	24·0	11·2	2·9	21·8	8·2	28·0	39·0	37·4	36·0
117·0	106·0	345·0	35·9	28·5	71·1	115·0	83·1	89·8	20·6	50·5	49·4	50·2	21·2	8·5	4·0	—	—	—	41·1	—	36·3
104·0	109·0	353·0	32·0	28·1	—	119·5	—	—	—	—	—	—	—	—	—	—	—	—	40·7	37·2	37·2
124·0	107·5	366·0	34·0	28·2	65·5	118·0	92·7	90·1	20·2	48·9	48·2	44·5	26·5	9·7	3·6	21·7	9·5	29·5	41·5	39·5	37·6
122·0	120·0	363·0	32·1	26·2	64·9	116·0	91·1	87·0	19·0	48·0	49·5	45·5	24·0	—	—	—	—	—	39·5	—	—
128·0	111·5	366·0	34·0	28·6	65·0	131·0	97·6	91·3	17·5	48·5	49·1	47·7	24·5	9·3	3·0	19·0	6·7	24·5	42·5	40·7	—
112·0	117·0	359·0	34·0	30·6	66·7	127·0	91·0	92·0	21·1	47·0	48·1	46·0	24·8	10·0	3·2	20·0	7·0	24·0	43·0	40·5	40·5
132·0	108·0	357·0	34·0	33·0	69·6	136·0	107·5	94·6	16·5	55·5	55·5	51·8	29·0	9·0	2·8	28·1	10·0	35·0	42·1	38·0	—
115·0	115·0	356·0	30·5	28·4	66·2	132·5	97·0	97·3	17·8	50·0	50·9	48·0	26·0	9·0	3·0	—	—	—	42·0	—	—
125·0	111·0	367·0	38·9	30·6	68·7	133·0	95·0	90·0	17·8	51·9	51·8	50·0	26·8	10·0	4·8	19·0	10·3	25·0	43·0	41·0	—
114·0	111·0	357·0	35·0	27·5	—	142·0	105·0?	—	—	53·0	53·0	50·0	29·7	7·5	3·1	19·6	11·0	29·5	45·0	43·8	42·0
129·0	110·0	370·0	36·8	32·0	74·0	141·0	100·0	91·0	21·7	57·8	57·1	51·5	26·4	10·5	4·2	21·0	9·3	28·0	45·3	42·1	40·3
136·0	105·0	373·0	35·5	29·6	70·0	139·5	103·0	97·0	21·1	53·1	51·2	48·8	26·2	10·8	3·2	23·5	9·0	32·5	44·0	41·7	40·0
115·0	109·0	347·0	—	—	71·3	135·0	105·0	—	21·9	52·0	53·1	47·6	26·3	8·2	2·5	24·0	8·0	30·0	43·0	41·8	40·2
117·0	112·0	360·0	35·3	29·5	70·5	130·0	97·2	94·5	18·5	52·8	51·8	50·5	26·8	6·2	—	—	—	—	44·0	—	—
112·0	117·0	364·0	37·3	31·0	—	—	97·0	—	—	53·5	54·1	50·0	31·3	10·0	3·2	20·0	11·8	31·0	42·5	40·6	39·0
134·0	107·0	374·0	35·0	31·4	71·6	128·0	93·6?	95·8	17·1	52·0	52·0	52·0	28·2	8·0	2·8	—	—	—	42·5	—	—
102·0	116·0	351·0	30·9	25·5	69·8	134·0	97·7	100·0	18·9	50·6	50·2	50·2	26·5	11·0	4·0	—	—	—	41·2	—	—
131·0	116·0	385·0	40·0	30·0	73·2	136·0	104·4	95·3	22·0	51·1	51·3	51·0	27·0	2·8	—	23·4	7·4	29·0	42·4	38·9	38·9
123·0	102·0	352·0	33·8	31·2	—	135·0	101·0	—	—	52·0	53·0	50·0	27·0	6·2	2·5?	19·4	7·9	26·0	44·0	41·9	—
113·0	113·5	349·5	33·0	27·4	63·1	121·0	94·0	85·5	16·3	47·0	47·2	46·2	26·0	7·4	2·0	19·6	9·5	30·0	39·8	37·9	—
114·0	106·0	346·0	37·0	31·6	70·6	134·5	101·2	100·9	15·3	54·0	54·5	53·8	25·2	10·0	3·8	23·3	9·4	30·0	42·5	40·0	38·9
113·0	113·0	348·0	—	30·0	66·1	130·0	104·8	104·2	17·0	50·0	49·2	49·0	27·0	9·0	2·0	23·4	7·6	29·0	42·4	40·0	40·0
122·0	105·0	359·0	34·0	30·3	74·6	131·0	100·0	94·0	—	54·5	54·5	—	27·1	6·0	2·0?	20·8	10·0	28·0	41·0	39·0	37·3
131·0	105·0	355·0	32·0	27·0	70·6	128·0	84·9	87·7	20·7	50·8	51·0	49·0	24·8	7·5	4·8	21·3	9·5	30·0	44·0	40·0	39·7
119·0	110·0	349·0	32·1	29·0	63·5	132·0	98·0	93·2	15·4	49·5	49·0	47·1	26·8	7·2	3·0	—	—	—	44·0	—	—
124·0	108·0	354·0	30·8	28·3	65·3	122·0	92·8	92·8	—	44·9	44·9	44·9	24·9	8·3	2·5	19·8	8·8	28·0	39·5	35·8	35·0
126·0	100·0	355·0	34·5	30·2	71·2	124·5	90·8	95·5	21·0	50·9	51·0	50·0	25·3	6·3	2·5?	19·9	9·3	29·0	37·5	35·7	—
121·0	109·0	366·0	31·5	25·0	71·2	138·0	95·4	92·0	21·0	50·5	50·2	48·0	26·7	5·8	3·0?	20·7	11·4	33·0	47·0	42·0	—
134·0	114·0	382·0	37·0	27·5	73·0	146·0	108·0	100·6	22·0	51·8	52·0	49·6	26·4	10·8	3·6	24·1	11·5	35·0	46·0	41·6	41·6
119·0	115·0	355·0	33·0	26·4	71·0	133·0	102·0	94·6	19·0	52·1	52·0	50·2	29·7	8·0	1·4	24·8	8·0	30·0	44·0	40·2	—
117·0	112·0	352·0	37·0	32·0	69·5	133·0	100·5	88·5	20·3	51·1	51·9	49·2	28·5	10·0	4·0	25·0	9·6	32·0	42·9	40·4	—
130·0	119·0	385·0	35·0	30·8	71·2	137·0	99·1	98·0	20·5	51·2	51·0	50·2	28·0	8·8	3·2	23·5	11·0	32·0	43·3	41·0	40·3
118·0	112·0	357·0	36·0	31·0	—	129·0	90·8	—	—	56·8	57·2	55·2	27·2	7·0	3·0	18·3	8·0	23·5	43·1	40·0	40·0
122·0	—	—	—	—	—	—	—	—	—	—	—	—	—	5·5	2·0	—	—	—	38·3	36·1	—
128·0	110·0	365·0	33·8	26·5	71·0	—	—	98·6	17·6	53·1	53·8	50·6	27·3	10·1	3·5	—	—	—	—	—	—
125·0	—	—	—	—	—	134·0	101·5	—	—	48·5	48·5	46·0	26·3	8·8	2·9	22·3	9·3	29·5	42·0	39·0	38·0
115·0	105·0	345·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

$O_1'R$	$\frac{Lacr.}{O_1R}$	O_2R	O_1L	$O_1'L$	$\frac{Lacr.}{O_1L}$	O_2L	G_1	G_1'	G_2	EH	$P\angle$	$\frac{Pros.}{P\angle}$	$100\frac{B}{L}$	$100\frac{H'}{L}$	$100\frac{B}{H'}$	$100\frac{B-H'}{L}$	*Oc. I.*	$100\frac{G'H}{GB}$	$100\frac{NB}{NHR}$	100
43·2	41·0	34·0	45·0	42·0	—	34·1	51·0?	47·0?	—	—	87°·1	86°·0	77·9	78·5	99·3	−0·55	65·5	62·9	55·3	58
39·5	—	35·0	42·5	—	—	35·0	46·0	—	39·0	12·0	91°·0	88°·7	74·2	—	—	—	—	71·7	49·1	59
—	—	33·6	39·8	—	—	35·0	50·1	—	—	—	83°·2	81°·9	77·7	78·3	99·3	−0·58	—	80·0	53·6	55
39·4	—	34·5	42·1	39·5	—	33·5	48·2	45·1	38·5	9·9	88°·0	86°·8	73·1	77·9	93·8	−4·82	59·6	67·7	48·7	54
—	—	31·9	—	—	—	—	—	—	—	—	—	—	78·0	74·0	105·5	4·07	61·3	—	—	—
40·7	38·3	32·1	42·5	39·8	—	32·2	48·5	45·5	40·0	12·5	83°·1	81°·6	79·0	81·5	96·9	−2·56	66·3	70·6	47·9	48
39·3	—	28·5	43·8	39·3	—	29·0	49·3	46·8	—	—	84°·5	82°·7	78·6	74·7	105·2	3·89	60·9	66·3	54·3	57
—	—	—	41·9	40·2	39·8	30·5	50·3	46·7	—	—	88°·0	83°·4	79·7	77·4	102·9	2·26	62·6	—	46·1	46
—	—	—	43·1	—	—	34·0	49·2	45·1	42·2	10·6	81°·2	79°·5	77·4	76·8	100·7	0·56	66·3	71·1	—	—
—	—	35·0	45·5	—	—	36·0	—	—	—	—	—	—	79·6	—	—	—	61·7	—	—	56
41·0	38·9	37·0	42·1	40·0	38·2	36·5	51·0	45·8	—	—	88°·9	86°·1	79·0	74·6	106·1	4·55	61·4	69·1	53·2	57
39·7	38·4	35·0	42·1	40·1	38·9	35·5	46·3	43·5	38·5	12·8	86°·2	83°·1	74·6	73·0	102·2	1·64	63·8	—	52·3	60
37·0	—	31·8	40·2	37·2	36·0	32·0	45·5	—	—	—	89°·5	—	75·4	—	—	—	63·4	68·8	57·2	59
—	39·1	31·7	43·7	—	—	—	51·5	47·0	—	—	86°·8	—	73·0	—	—	—	—	72·3	—	—
—	—	—	41·5	38·0	38·0	35·5	49·3	44·5	37·9	10·2	84°·4	81°·5	78·2	78·8	99·3	−0·59	62·3	—	54·1	55
—	—	—	—	—	—	—	—	—	—	—	—	—	78·7	76·0	103·6	2·73	64·7	—	—	—
—	—	35·9	43·0	—	—	35·4	53·1	49·5	42·8	10·5	83°·5	81°·2	77·2	75·3	102·6	1·97	62·4	72·4	48·2	50
38·2	38·2	31·6	41·5	39·0	38·5	32·3	45·1	42·8	36·2	9·1	88°·0	85°·1	79·0	78·7	100·4	0·28	62·0	68·1	54·0	59
41·0	39·8	35·6	44·0	41·8	40·5	36·5	50·7	48·0	41·8	13·4	88°·0	86°·5	79·0	74·1	106·5	4·83	66·1	74·5	49·4	—
42·0	40·3	32·9	43·0	39·8	39·8	33·1	49·6	—	—	—	—	—	82·9	80·3	103·2	2·60	69·6	69·1	54·7	58
38·6	37·0	30·0	40·8	38·3	36·7	30·6	47·0	43·0	41·8	15·0	89°·0	86°·6	76·9	75·8	101·4	1·10	68·7	72·3	51·5	54
38·0	38·0	32·3	41·9	38·1	38·1	32·9	49·0	44·1	39·4	15·1	89°·4	85°·9	82·1	78·6	104·4	3·47	61·4	71·6	46·8	46
41·0	40·7	33·0	43·2	40·3	39·8	33·0	—	—	—	—	87°·8	85°·6	79·8	77·6	102·8	2·21	64·1	65·9	56·2	61
—	—	34·7	43·0	—	—	35·3	—	—	—	—	—	—	76·1	78·0	97·5	−1·97	62·3	—	—	—
—	—	32·5	44·0	—	—	31·8	54·2	50·3	45·5	16·0	84°·3	81°·5	73·3	75·9	96·5	−2·67	58·8	66·9	50·9	57
—	—	32·9	44·1	—	—	32·9	55·8	52·1	44·6	17·0	83°·9	80°·2	79·5	78·4	101·5	1·15	60·2	75·9	50·4	56
—	39·9	34·0	42·8	—	—	34·6	—	—	—	—	91°·0	—	78·4	—	—	—	—	62·7	56·5	58
—	38·6	33·5	42·8	—	38·8	32·5	46·0	41·2	—	—	88°·0	85°·3	76·4	77·6	98·5	−1·15	58·7	74·7	51·5	56
—	—	34·9	44·0	—	—	34·9	48·0	44·0	—	—	89°·1	86°·9	75·1	75·1	100·0	0·00	58·5	70·4	50·4	54
—	—	—	43·0	—	—	33·5	—	—	—	—	—	—	77·0	77·0	100·0	0·00	59·6	—	—	—
42·0	39·5	31·6	43·3	40·0	38·5	32·5	—	—	—	—	91°·0	87°·1	76·2	75·9	100·4	0·27	57·2	71·6	57·5	60
—	—	34·0	42·2	—	—	34·5	49·5	46·6	36·9	11·9	84°·1	81°·9	78·8	76·1	103·6	2·73	61·8	71·5	52·7	53
—	—	31·2	39·4	—	—	—	43·7	39·3	37·1	11·1	86°·9	83°·8	78·1	82·0	95·3	−3·89	66·6	67·0	57·9	61
37·2	37·2	32·5	38·7	36·4	36·4	33·8	43·0	39·8	37·1	5·8	87°·5	84°·1	79·6	80·5	98·9	−0·90	65·4	63·2	55·7	59
37·5	36·0	31·9	41·0	37·0	36·6	32·1	49·0	44·8	40·3	12·7	83°·2	80°·8	78·4	76·9	101·9	1·48	59·3	72·0	61·3	61
—	—	33·0	41·0	—	—	33·3	52·2	48·3	—	—	81°·5	78°·1	78·1	79·7	97·8	−1·74	66·0	68·8	60·3	60
—	—	32·0	40·0	—	—	31·6	46·0	43·6	39·1	9·1	77°·9	75°·5	79·0	82·7	95·6	−3·65	67·7	57·8	61·9	62
36·2	35·5	33·5	39·3	36·2	35·2	32·9	46·3	42·5	35·2	11·2	87°·8	84°·4	78·6	77·1	101·9	1·49	62·1	73·7	48·0	48
—	—	—	38·0	—	—	33·0	—	—	—	—	87°·1	—	79·9	—	—	—	62·6	—	51·0	—
36·3	34·4	32·1	39·0	35·6	35·1	33·0	44·0	40·8	37·9	10·5	87°·3	83°·0	76·2	77·3	98·5	−1·16	63·6	66·5	46·0	49
—	—	31·3	40·7	—	37·2	32·5	45·9	41·3	38·6	9·0	85°·4	84°·5	77·6	75·3	103·1	2·35	64·7	60·7	55·0	60
—	—	34·0	40·3	—	—	35·0	—	—	—	—	—	—	75·4	77·2	97·7	−1·75	62·9	70·2	—	—
38·9	36·9	34·8	41·5	—	—	35·4	44·0	40·9	36·9	9·6	91°·7	90°·0	73·8	74·4	99·2	−0·58	63·9	71·6	47·1	49
—	—	32·0	40·0	—	—	32·9	41·0	36·5	38·0	9·0	89°·7	—	83·5	79·9	104·6	3·66	64·4	69·0	50·1	49
—	—	33·6	40·6	—	—	33·6	—	—	—	—	90°·0	—	81·3	—	—	—	—	66·3	54·6	50
37·4	36·0	31·8	40·0	38·0	36·8	31·0	49·0	46·3	38·4	12·6	86°·8	84°·8	74·3	74·2	96·2	−2·81	63·4	78·4	44·9	44
—	36·3	34·9	39·5	—	—	34·6	44·0	41·5	35·4	13·8	80°·8	78°·4	76·6	74·0	103·6	2·63	64·9	85·6	42·0	42
37·2	37·2	33·8	—	—	—	—	—	—	—	—	—	—	77·5	81·1	95·6	−3·55	71·5	—	—	—
39·5	37·6	33·5	41·5	39·5	37·6	33·3	45·2	41·0	—	—	89°·1	87°·6	77·4	72·3	107·0	5·08	68·4	70·7	54·2	52
—	—	32·8	38·9	—	—	32·8	—	—	—	—	86°·5	84°·0	76·9	75·1	102·4	1·78	59·2	71·2	50·0	52
40·7	—	33·6	42·1	39·5	—	34·0	43·0	40·5	36·4	9·2	90°·9	88°·0	79·3	78·7	100·7	0·56	64·7	66·6	50·5	52
40·5	40·5	33·0	43·4	41·0	41·0	34·0	45·0	42·6	—	—	89°·0	86°·4	82·4	80·0	102·9	2·35	69·3	73·3	52·8	52
38·0	—	32·9	41·3	36·6	36·6	33·3	44·2	40·5	40·0	8·7	89°·8	87°·0	85·3	77·7	109·8	7·65	68·1	64·7	52·3	52
—	—	30·5	43·9	—	—	31·0	50·0	47·7	38·9	11·3	85°·0	83°·0	86·1	81·3	105·9	4·82	63·1	68·2	52·0	52
41·0	—	31·6	42·0	40·1	—	31·9	—	—	—	—	90°·7	88°·4	84·9	78·7	107·9	6·18	70·2	72·3	51·6	52
43·8	42·0	36·0	44·6	42·9	41·3	36·0	50·5	45·8	—	—	—	—	84·2	78·0	108·0	6·21	60·7	—	56·0	52
42·1	40·3	34·0	45·0	41·0	40·0	34·5	48·0	44·4	—	—	91°·9	—	79·2	77·0	102·9	2·25	62·9	74·0	45·7	52
41·7	40·0	32·6	43·6	40·0	39·1	32·1	50·8	45·0	—	—	91°·0	89°·7	82·0	79·8	102·8	2·25	66·3	68·0	49·3	52
41·8	40·2	34·0	44·0	41·5	40·0	35·0	50·3	45·0	43·7	13·5	86°·0	83°·3	87·9	—	—	—	65·4	67·9	50·6	52
—	—	31·8	43·8	—	—	32·1	50·5	47·0	38·3	17·0	84°·0	80°·8	86·3	86·3	100·0	0·00	67·8	72·5	50·8	52
40·6	39·0	33·0	43·1	41·0	38·8	33·0	—	—	—	—	—	—	79·9	73·2	109·2	6·70	59·6	—	58·5	60
—	—	35·0	42·9	—	—	34·3	49·0	44·0	38·5	10·5	86°·5	—	81·5	83·2	97·9	−1·73	64·9	—	54·2	52
—	—	36·0	41·5	—	—	34·8	52·6	48·5	40·0	15·5	87°·2	86°·0	77·7	72·0	107·9	5·71	55·9	71·4	52·4	52
38·9	38·9	34·0	41·5	39·2	39·2	31·8	47·3	43·0	40·9	10·3	87°·5	85°·9	81·9	82·4	99·3	−0·55	64·2	70·1	52·8	52
41·9	—	33·9	42·5	40·0	37·8	33·9	—	—	—	—	—	—	90·2	85·3	105·8	4·91	67·5	—	51·9	52
37·9	—	30·0	39·2	36·2	—	32·0	—	—	—	—	88°·6	86°·0	87·6	81·8	107·0	5·76	64·7	67·1	55·3	52
40·0	38·9	34·3	41·4	39·5	38·1	34·1	53·0	47·0	35·5	6·0	81°·0	78°·0	85·7	77·4	110·8	8·33	68·9	69·8	46·7	48
40·0	40·0	32·0	41·0	38·0	38·0	32·8	45·2	44·2	—	—	81°·0	78°·0	81·0	—	—	—	64·4	63·1	54·0	—
39·0	37·3	31·2	41·2	38·7	37·3	32·0	48·0	42·6	—	—	89°·8	87°·5	88·0	82·6	106·5	5·39	68·5	74·6	49·7	—
40·0	39·7	34·2	42·0	38·7	37·8	34·0	47·0	42·0	35·5	12·5	91°·0	87°·4	84·2	73·7	114·3	10·53	65·8	83·2	48·8	52
—	—	31·0	43·0	—	—	32·8	45·6	42·0	—	—	84°·6	82°·5	83·7	79·5	105·3	4·22	65·5	64·8	54·1	52
35·8	35·0	33·3	39·8	37·0	35·3	33·5	46·0	43·0	—	—	84°·9	83°·2	84·1	79·9	105·3	4·27	66·9	70·4	55·5	52
35·7	—	31·0	38·8	34·6	—	31·0	49·0	45·0	33·0	13·0	88°·6	86°·0	84·6	79·2	106·9	5·44	66·4	78·4	49·7	52
42·0	—	37·8	45·0	40·0	—	37·0	48·0	43·0	40·5	13·0	88°·6	86°·0	87·9	81·9	107·4	6·02	63·5	74·6	52·9	52
41·6	41·6	33·0	43·8	41·0	41·0	32·5	[illegible]	51·0	—	—	86°·9	84°·8	81·2	79·0	102·8	2·21	60·2	67·6	51·0	52
40·2	—	33·7	44·0	39·2	—	33·5	[illegible]	43·0	—	—	87°·0	85°·2	80·6	77·1	104·6	3·53	61·1	69·6	57·0	52
40·4	—	36·5	43·2	40·0	—	35·8	43·8	44·0	—	—	90°·0	88°·0	82·4	77·8	105·9	4·61	67·0	69·2	55·8	52
41·0	40·3	35·1	43·0	40·0	—	35·5	49·0	44·1	—	—	85°·0	82°·4	83·0	82·2	101·0	0·85	61·9	71·8	54·7	52
40·0	40·0	35·0	43·7	40·6	40·6	34·8	—	—	—	—	—	96°·7	87·3	80·1	109·0	7·23	59·0	—	47·9	49
36·1	—	33·8	—	—	—	—	—	—	—	—	—	—	84·4	—	—	—	—	—	—	—
—	—	—	43·1	40·2	39·0	33·9	49·0	45·2	—	—	86°·2	84°·1	84·5	81·3	103·9	3·21	67·3	—	51·4	52
39·0	38·0	34·6	42·9	40·0	38·3	34·2	—	—	—	—	—	—	86·4	76·3	113·2	10·06	—	—	54·2	52
—	—	32·0	39·5	—	—	32·7	43·0	—	40·5	15·3	90°·0	88°·5	86·8	—	—	—	73·2	76·1	43·6	52

100 $\frac{NB}{NHR}$	100 $\frac{NB}{NH'}$	100 $\frac{DS}{DC}$	100 $\frac{SS}{SC}$	100 $\frac{O_2}{O_1R}$	100 $\frac{O_2}{O_1'R}$	100 $\frac{O_2}{O_1L}$	100 $\frac{G_2}{G_1}$	100 $\frac{G_2}{G_1'}$	100 $\frac{fmb}{fml}$	$B\angle$	$A\angle$	$N\angle$	100 $\frac{EH}{G_2}$
55·3	58·5	34·2	39·8	73·4	78·7	75·8	—	—	85·4	40°·8	75°·0	64°·2	—
49·1	50·2	—	27·8	79·9	88·6	82·4	84·8		—	—	—	—	30·8
53·6	55·2	—	36·9	85·1	—	87·9	—	—	—	42°·7	68°·5	68°·8	—
48·7	54·6	39·7	30·4	79·3	87·6	79·6	79·9	85·4	86·4	42°·5	74°·0	63°·5	25·7
—	—	—	44·1	70·7	—	—	—	—	—	—	—	—	—
47·9	48·3	35·7	25·6	74·3	78·9	75·8	82·5	87·9	84·4	40°·0	72°·3	67°·7	31·2
54·3	57·3	42·0	22·2	66·6	72·5	66·2	—	—	85·7	42°·2	68°·9	68°·9	—
46·1	46·8	66·7	48·9	—	—	72·8	—	—	88·3	45°·4	72°·6	62°·0	—
—	—	—	—	—	—	78·9	85·8	93·6	82·6	42°·0	69°·5	68°·5	25·1
—	56·8	—	30·0	76·8	—	79·1	—	—	—	—	—	—	—
53·2	57·9	29·0	22·2	85·3	90·2	86·7	—	—	112·4	38°·7	72°·6	68°·7	—
52·3	60·9	33·6	34·0	84·7	88·2	84·3	83·1	88·5	69·1	—	—	—	33·2
57·2	59·1	—	18·9	79·5	85·9	79·6	—	—	—	—	—	—	—
—	—	—	—	73·0	—	—	—	—	—	—	—	—	—
54·1	55·2	36·9	40·0	—	—	85·5	76·9	85·2	80·9	41°·9	71°·0	67°·1	26·9
—	—	—	—	—	—	—	—	—	—	—	—	—	—
48·2	50·8	—	29·7	81·6	—	82·3	80·6	86·5	77·5	43°·3	66°·9	60°·8	24·5
54·0	59·1	38·9	39·7	75·8	82·7	77·8	80·3	84·6	79·5	40°·0	75°·4	64°·6	25·1
49·4	—	41·9	28·3	82·8	86·8	83·0	82·4	87·1	—	44°·0	69°·1	66°·9	32·1
54·7	58·0	44·5	45·5	74·8	78·3	77·0	—	—	93·3	38°·5	71°·5	70°·0	—
51·5	54·3	30·5	37·5	72·8	77·7	75·0	88·9	97·2	85·8	42°·2	73°·6	64°·2	35·9
46·8	46·8	32·9	45·2	77·3	85·0	78·5	80·4	89·3	82·3	42°·6	71°·1	66°·3	38·3
56·2	61·2	39·1	42·2	74·7	80·5	76·4	—	—	75·4	41°·8	73°·4	64°·8	—
—	—	—	37·6	79·8	—	82·1	—	—	85·5	—	—	—	—
50·9	57·7	—	29·1	75·2	—	72·3	83·9	90·5	88·6	42°·9	70°·2	66°·9	35·2
50·4	56·1	—	38·0	71·2	—	74·6	79·9	85·6	83·1	42°·2	67°·8	70°·0	38·1
56·5	58·8	—	34·9	79·4	—	80·8	—	—	—	—	—	—	—
51·5	56·3	—	42·4	77·9	—	75·9	—	—	72·3	42°·1	73°·6	64°·3	—
50·4	52·2	—	34·7	81·2	—	79·3	—	—	80·7	41°·5	73°·9	64°·6	—
—	—	—	—	—	—	77·9	—	—	76·9	—	—	—	—
57·5	60·7	46·0	65·4	71·8	75·2	75·1	—	—	85·7	43°·5	76°·9	59°·6	—
52·7	53·0	—	38·0	81·3	—	81·8	74·5	79·2	80·0	41°·8	70°·7	67°·5	32·2
57·9	61·8	—	—	75·4	—	—	84·9	94·4	82·2	40°·5	73°·5	66°·0	29·9
55·7	59·2	32·1	—	82·5	87·4	87·3	86·3	93·2	78·6	39°·1	73°·4	67°·5	15·6
61·3	61·6	35·4	31·7	78·8	85·1	78·3	82·2	90·0	—	—	—	—	31·5
60·3	60·3	—	28·7	78·8	—	81·2	—	—	85·9	39°·6	69°·9	70°·5	—
61·9	65·7	—	22·2	80·0	—	79·0	85·0	89·7	78·9	35°·6	72°·5	72°·5	23·3
48·0	48·9	43·1	34·4	83·8	92·5	83·7	76·0	82·8	84·0	42°·0	73°·2	64°·8	31·8
51·0	—	—	—	—	—	86·8	—	—	—	—	—	—	—
46·0	46·0	42·5	38·3	84·3	88·4	84·6	86·1	92·9	79·6	42°·6	72°·4	65°·0	27·7
55·0	64·0	—	—	77·5	—	79·9	84·1	93·5	80·7	38°·5	70°·0	71°·5	23·3
—	—	—	—	82·9	—	80·8	—	—	76·7	42°·0	76°·9	61°·1	—
47·1	49·0	—	51·3	84·5	89·5	85·3	83·9	90·2	82·6	41°·6	75°·8	62°·6	26·0
50·1	49·9	—	—	80·0	—	82·3	92·7	104·1	79·4	42°·0	75°·5	62°·5	23·7
54·6	56·6	—	25·6	84·2	—	82·8	—	—	—	—	—	—	—
44·9	45·1	37·6	25·9	81·5	85·0	77·5	78·4	82·9	80·3	41°·6	72°·6	65°·8	32·8
42·0	42·2	—	47·1	84·9	—	87·6	80·5	85·3	79·4	45°·8	69°·2	65°·0	39·0
—	—	—	—	83·0	90·9	—	—	—	87·8	—	—	—	—
54·2	59·6	43·8	37·1	80·7	84·8	80·2	—	—	82·9	40°·8	75°·0	64°·2	—
50·0	52·7	—	—	83·0	—	84·3	—	—	81·6	43°·4	68°·9	67°·7	—
50·5	51·4	35·3	32·3	79·1	82·6	80·8	84·7	89·9	84·1	39°·0	79°·8	61°·2	25·3
52·8	53·9	35·0	32·0	76·7	81·5	78·3	—	—	90·0	41°·2	72°·5	66°·3	—
52·3	56·0	35·6	31·1	78·1	86·6	80·6	90·5	98·8	97·1	41°·7	73°·0	65°·3	21·8
52·0	54·2	—	33·3	72·6	—	70·6	77·8	81·6	93·1	40°·5	71°·5	68°·0	29·0
51·6	53·6	54·2	48·0	73·5	77·1	76·0	—	—	78·7	42°·0	76°·3	61°·7	—
56·0	59·4	56·1	41·3	80·0	82·2	80·7	—	—	78·6	—	—	—	—
45·7	51·3	44·3	40·0	75·1	80·8	76·7	—	—	87·0	45°·0	75°·0	60°·0	—
49·3	53·7	38·3	29·6	74·1	78·2	73·6	—	—	83·4	40°·5	74°·8	64°·7	—
50·6	55·3	33·3	30·5	79·1	81·3	79·5	86·9	97·1	—	—	—	—	30·9
50·8	53·1	—	—	72·3	—	73·3	75·8	81·5	83·6	43°·0	71°·0	66°·0	44·4
58·5	62·6	59·0	32·0	77·7	81·3	76·7	—	—	83·1	—	—	—	—
54·2	54·2	—	35·0	82·4	—	80·0	78·6	87·5	89·7	42°·5	72°·5	65°·0	27·3
52·4	52·8	—	36·4	87·4	—	83·9	76·0	82·5	82·5	41°·0	69°·4	69°·6	38·8
52·8	52·9	31·6	—	80·2	87·4	76·6	86·5	95·1	75·0	44°·0	71°·4	64°·6	25·2
51·9	54·0	40·7	—	77·0	80·9	79·8	—	—	92·3	—	—	—	—
55·3	56·3	48·5	27·0	75·4	79·2	81·6	—	—	83·0	42°·0	74°·5	63°·5	—
46·7	46·8	40·3	38·0	80·7	85·8	82·4	67·0	75·5	85·4	41°·7	67°·1	71°·2	16·9
54·0	55·1	32·5	22·2	75·5	80·0	80·0	—	—	—	—	—	—	—
49·7	—	48·1	—	76·1	80·0	77·7	—	—	89·1	45°·7	69°·7	64°·6	—
48·8	50·6	44·6	64·0	77·7	85·5	81·0	75·5	84·5	84·4	46°·0	70°·3	63°·7	35·2
54·1	56·9	—	41·7	70·5	—	76·3	—	—	90·3	39°·2	72°·8	68°·0	—
55·5	55·5	44·4	30·1	84·3	93·0	84·2	—	—	91·9	41°·3	69°·0	69°·7	—
49·7	50·6	46·7	—	82·7	86·8	79·9	67·3	73·3	87·5	43°·7	68°·3	68°·0	39·4
52·9	55·6	55·1	—	80·4	90·0	82·2	84·4	94·2	79·4	45°·0	69°·0	66°·0	32·1
51·0	53·2	47·7	33·3	71·7	79·3	74·2	—	—	74·3	41°·8	71°·4	66°·8	—
57·0	59·2	32·3	17·5	76·6	83·8	76·1	—	—	80·0	44°·6	78°·0	57°·4	—
55·8	57·9	38·4	40·0	85·1	90·3	82·9	—	—	86·5	42°·8	76°·9	60°·3	—
54·7	55·8	46·8	36·4	81·1	85·6	82·6	—	—	88·0	41°·9	71°·4	66°·7	—
47·9	49·3	43·7	42·9	81·2	87·5	79·6	—	—	86·1	—	—	—	—
—	—	—	36·4	88·3	93·6	—	—	—	—	—	—	—	—
51·4	54·0	—	34·7	—	—	78·7	—	—	78·4	41°·4	72°·0	66°·6	—
54·2	57·2	41·7	33·0	82·4	88·7	79·7	—	—	—	—	—	—	—
43·6	46·2	—	—	77·1	—	82·8	—	—	—	—	—	—	—

		Nr.	L	F	B	H′	H	OH	OH′	LB	B′	U	Gl.U	Q′	βQ′	S
ANDAMANESEN	DAJAKS, MÄNNLICH	26	174	169·5	142·5	132	132·5	112	—	100·0	91·0	500	505	310	307	11
		27	182·5	180	152	134	135·5	120	—	97·2	97·2	531	532	328	326	11
		28	171	169·5	145	129	135·5	112·5	—	96·0	89·4	497	504	307	297	10
		29	175	172	138	130	131	111	—	99·1	95·0	504	506	308	301	10
		30	170	170	142	133	134	112	—	95·5	98·1	492	495	312	307	10
		32	165·5	166	136	122	123·5	105	—	92·2	91·3	481	484	297	296	10
		33	179·5	180	140·5	134	134·5	119	—	103·4	95·0	518	520	322	320	11
		34	184	181	127·5	141	140	117·5	—	107·1	95·0	496	509	304	305	11
		35	179	176·5	142	131	132	113·5	—	95·3	97·4	516	518	315	315	11
		37	171·5	169	135	132	133	113	—	96·5	80·0	484	489	309	304	11
		39	173	172·5	151	135	136	116	—	97·6	97·2	508	510	326	321	11
		42	181·5	180	130	138	140	116·5	—	102·5	90·0	497	505	307	305	11
		43	174	174	142	138	141	116	—	103·3	89·7	501	505	311	309	10
		44	176	175	142	132	133	114	—	96·0	90·1	508	515	316	314	11
		45	172	171	146·5	132·5	134	118·5	—	97·1	93·2	505	506	330	325	11
		46	172	172·5	132	—	—	116·5	—	—	92·3	483	490	308	304	10
		22 *a*	174	174	136	128·5	129·5	110·5	—	98·1	88·2	496	498	308	304	10
		22 *b*	168·5	168	129	131	132	110·5	—	94·0	92·7	479	482	292	290	10
		22 *c*	175	172	135·5	141	142	120·5	—	104·2	99·0	504	507	326	325	11
		22 *e*	172	171·5	135	135·5	136·5	112·5	—	105·0	97·0	493	496	304	297	10
		22 *f*	179	179·5	135	139	141	116	—	103·2	90·1	506	512	315	310	10
		22 *g*	180	179	136	138	139	117	—	104·0	90·8	505	506	313	310	11
		22 *h*	178	178	140	139	140	117	—	100·0	97·2	505	505	314	313	10
		1	175	173·5	139	134·5	133·5	114·5	—	96·0	94·2	509	512	316	314	11
		4	176	172·5	138	132·5	133	118·5	—	97·0	88·0	495	505	319	314	11
		5	175·5	174	—	—	—	—	—	—	87·3	495	499	—	—	10
		7	176·5	178	130	—	—	110	—	—	93·5	489	495	296	—	—
		8	184	182	143	138	138	114	—	99·6	102·0	526	530	320	320	11
		9	165·5	163	142	134	134	116	—	94·0	91·0	488	494	317	312	10
		10	174·5	172	142·5	—	—	121	—	—	96·2	502	510	326	319	10
		11	189	189·5	135	141	140	118·5	—	106·0	95·0	521	526	315	318	11
		14	173	171	132	133	136	111	—	95·3	97·1	487	500	298	294	10
		15	182	179·5	136·5	128	130	109	—	96·0	91·0	510	515	297	291	10
		16	173	173	123	130	132·5	109·5	—	97·1	94·0	481	485	291	288	10
		17	172	171·5	139	136	—	115·5	—	101·1	91·3	495	499	316	315	11
		18	184·5	185	142	145	146	122	—	105·2	101·4	529	530	331	329	12
		19	182	183	133	134·5	133·5	112	—	108·2	93·5	509	515	305	304	11
		24	166	165·5	133	139·5	137·5	117	—	95·0	90·8	478	480	309	309	11
		25	184	185	132	—	—	116	—	—	94·3	510	512	305	—	—
		36	171·5	168	140	134	134·5	111·5	—	99·2	89·0	491	495	308	304	11
		41	175·5	177·5	136	139	140	115	—	101·0	93·0	501	504	313	311	10
	MÄNNLICH	R.C.S. F.C. 1202	165	165	138	135	135	116	115	92·0	90·0	480	479	310	302	11
		1205	168	166·5	139	125	125	110	109·5	93·0	92·2	487	489	302	300	10
		1205·3	167	168	138	131·5	134·5	115·5	113	93·0	83·4	476	485	307	300	10
		1205·5	164	163	135·5	123	122·5	107	106	90·1	89·7	472	469	293	290	10
		1206	171	172	134	133	133	110	110·5	93·0	90·0	490	485	296	296	10
		1207	—	—	139	132	133·5	115·5	114·5	95·7	91·0	—	—	—	—	—
		1211	174	173	136·5	131	132·5	117	114·5	95·0	94·0	—	—	—	—	10
		1216·1	174·5	171·5	143	140·5	140	119·5	119	94·2	100·4	502	505	323	320	11
		1217	167·5	—	131	128	128·5	111	110	96·2	92·4	475	472	301	294	10
		B.D. 1472	167	166	136	130	129·5	111·5	110·5	93·5	89·6	487	480	297	293	10
		1473	166	166	134	126	126·5	111	109·5	93·6	90·9	481	476	299	295	10
		1474	165	161·5	136	126	127·5	111	108	92·5	87·6	475	465	295	286	10
		1475	167·5	169	133	130	129	112	112	89·5	94·6	482	480	300	297	10
		1479	169·5	169·5	139·5	128	128·5	113·5	111·5	94·5	96·1	484	480	307	299	10
		1481	171	172	144·5	144	142·5	124	123·5	101·1	92·0	492	490	332	320	11
		1482	172	172	142·5	133	133	116	114	92·2	93·0	501	501	317	312	10
		1483	164·5	164·5	136	128	128·5	111	109	93·6	99·2	482	481	301	296	10
		1485	168·5	167	134	127	128	107	104	92·4	87·2	478	473	292	284	10
		B.M. v. E. i	168	166	131·5	131	—	—	—	95·0	95·2	—	—	—	—	10
		5.11.25.1	168	166	134	132	—	—	—	93·1	93·0	—	—	—	—	10
		Oxf. 20/1038	161	160·5	129	127	—	—	—	94·0	92·5	—	—	—	—	—
		20/1040	166	164	136	128	—	—	—	91·0	97·0	—	—	—	—	—
		20/1	163·5	163	135	126	—	—	—	91·0	92·0	—	—	—	—	—
		20/4	160	159	133	124	—	—	—	90·0	93·0	—	—	—	—	—
	WEIBLICH	R.C.S. F.C. 1203	153	153	133	126	125	111	110	86·5	92·7	457	461	301	294	10
		1205·2	161	161·5	141	122	121·5	106·5	106·5	90·0	90·0	471	473	301	294	10
		1205·4	159	160	129	124·5	—	103·5	103	89·2	91·0	460	464	288	282	9
		1213	160	160	132	127	126·5	110	108·5	91·4	90·4	457	457	296	292	10
		1214	158	156	132	125·5	126	111·5	109	88·0	90·7	452	459	297	290	10
		1215	157	157	131·5	121	—	105	103·5	86·1	94·0	456	459	285	280	9
		1216	160	161	135	126·5	—	110	110	89·6	89·0	464	465	302	297	10
		1218	165·5	165	134·5	124·5	—	109·5	110	91·2	86·0	474	477	304	295	10
		1212	162	162	137	—	—	107·5	105·5	89·0	86·2	—	—	—	—	—
		B.D. 1480	160	159	137	129·5	129	108	108	92·5	91·0	467	466	300	296	10
		B.M. v. E. ii	163	162·5	127	127	—	—	—	90·0	92·3	—	—	—	—	10
		v. E. iii	160	160	127	115	—	—	—	86·3	91·6	—	—	—	—	9
		5.11.25.2	161	159	131·5	130										

Q′	*βQ′*	S_1'	S_2'	S_3'	S_1	S_2	S_3	*S*	*fml*	*fmb*	*G′H*	*J*	*GB*	*GL*	*PH*	*NHR*	*NHL*	*NH′*	*NB*	*SC*	*SS*	*DC*
310	307	110·0	110·0	96·5	123	123	104	352	39·8	32·7	69·0	135	103·1	94·4	18·0	51·8	52·3	50·0	27·0	8·5	3·0	20·0
328	326	116·0	118·0	100·0	136	134	114	384	34·1	28·9	66·4	135	97·8	85·8	16·0	52·0	52·0	51·2	27·3	8·0	3·0	19·0
307	297	100·0	107·5	103·0	112	123	124	359	36·2	30·5	66·8	130	103·6	100·0	17·0	53·1	51·1	49·5	30·0	9·0	3·9	20·8
308	301	107·9	107·9	92·1	126	122	106	354	33·9	32·4	62·4	132·5	97·0	101·6	15·7	50·0	51·1	46·0	27·0	2·8	—	18·8
312	307	105·3	101·0	101·0	121	112	120	353	36·0	30·2	69·0	129·5	98·2	95·3	18·4	51·8	51·7	49·3	22·7	6·0	3·1	20·0
297	296	104·0	102·3	85·3	119	115	103	337	34·0	28·0	—	130·5	94·2	—	—	—	—	53·2	33·5	12·0	3·7	21·2
322	320	110·0	105·0	104·0	127	115	121	364	37·8	32·0	76·0	132·5	101·1	107·2	20·3	58·0	57·0	54·8	27·0	8·5	4·0	21·2
304	305	118·7	106·2	109·2	133	114	130	377	33·1	30·9	67·0	129·5	101·2	97·0	17·5	52·1	52·9	48·6	28·1	9·9	4·0	21·4
315	315	116·0	105·3	99·0	135	120	112	367	38·5	31·9	64·0	140	99·6	84·0	10·1	55·0	54·1	53·0	29·0	8·5	3·1	22·7
309	304	110·0	105·0	95·0	125	119	112	357	35·2	28·9	—	127·5	90·3	—	—	55·0	55·0	54·0	27·9	5·1	2·0	16·0
326	321	110·0	106·0	97·3	124	120	115	359	35·0	31·5	—	144·5	104·3	—	—	54·6	55·7	54·0	31·0	10·0	4·9	22·8
307	305	111·2	120·0	100·4	126	135	116	377	41·0	31·2	63·0	131	103·0	100·3	16·2	48·9	49·0	47·0	25·5	4·6	—	21·3
311	309	108·0	109·0	96·0	120	123	108	352	41·0	33·9	77·0	140	105·0	100·2	20·8	57·2	56·9	56·0	30·3	7·1	3·2	18·9
316	314	111·1	106·2	102·0	126	117	125	368	32·1	26·9	71·8	132	101·0	99·5	18·9	59·9	59·8	51·5	29·9	9·1	2·5	18·1
330	325	113·0	112·0	91·0	128	130	105	364	34·0	26·8	77·0	134·5	99·0	94·2	21·0	56·0	55·3	53·2	26·2	5·3	—	20·3
308	304	108·5	115·0	—	121	130	—	—	—	—	72·0	133	109·6	—	22·0	53·1	53·1	50·0	29·2	7·2	3·4	21·3
308	304	107·3	105·2	84·0	125	134	100	359	34·0	32·1	71·0	124·5	94·0	100·6	23·0	51·5	53·2	47·1	27·0	8·0	1·8	18·5
292	290	107·2	106·0	91·6	123	121	108	353	36·1	28·0	68·3	124	95·0	88·0	18·9	51·0	51·0	47·8	25·3	10·1	4·4	20·0
326	325	111·0	113·3	104·0	129	130	117	376	33·1	29·5	69·3	136	102·1	89·5	17·0	53·0	54·7	50·0	27·0	7·1	2·3	18·5
304	297	107·0	108·5	88·2	118	126	101	345	39·8	32·0	64·0	135·5	95·0	93·0	18·1	49·5	48·4	45·5	26·9	5·5	—	21·0
315	310	108·0	110·5	96·5	127	125	114	366	36·2	27·2	67·6	134	98·0	98·9	20·7	49·0	50·0	47·0	25·4	6·0	2·0	18·5
313	310	111·5	109·0	99·0	127	121	115	363	37·0	31·0	72·0	128·5	101·8	103·5	19·8	53·7	54·3	52·3	28·0	10·5	4·5	21·3
314	313	106·1	103·4	102·0	121	126	121	368	39·5	31·1	75·0	132	112·3	96·5	21·2	52·9	52·8	52·0	26·9	8·1	1·0	24·0
316	314	111·5	114·0	95·0	130	126	112	368	33·0	28·0	69·1	139	106·7	90·2	17·1	53·2	51·2	49·8	27·3	10·0	2·1	24·3
319	314	110·0	115·0	95·0	125	133	114	372	30·2	28·0	69·0	132·5	99·6	99·1	21·7	51·4	52·0	47·5	27·9	9·1	3·1	21·2
—	—	104·0	109·0	—	120	120	—	—	—	—	64·5	—	106·0	—	14·4	51·1	51·8	51·0	26·0	5·3	—	19·0
296	—	—	—	—	—	—	—	—	—	—	—	138	103·0	—	—	—	—	48·2	27·0	11·3	2·8	—
320	320	118·0	106·0	108·0	136	119	126	381	37·9	31·0	75·0	132	107·0	93·0	19·3	57·1	57·1	55·3	27·2	8·5	2·5	22·0
317	312	107·0	110·0	92·0	120	126	108	355	34·0	27·9	—	133	—	—	—	51·5	51·8	48·0	27·0	11·0	4·2	22·5
326	319	108·2	111·3	—	120	125	—	—	—	—	73·0	135	101·2	—	20·2	56·2	56·2	51·1	26·5	11·0	3·0	23·2
315	318	114·0	116·0	96·5	130	126	123	379	36·3	29·2	74·0	137	108·4	100·0	21·0	54·2	54·2	51·2	27·7	8·5	2·3	22·3
298	294	102·0	104·0	110·7	116	115	134	365	35·4	27·9	68·2	136	101·3	88·9	20·3	47·2	46·9	47·1	24·3	11·0	2·3	23·2
297	291	101·5	109·0	112·0	116	119	140	375	32·8	31·6	64·0	132	102·1	99·0	17·0	47·5	47·8	46·9	27·5	7·0	1·8	21·0
291	288	104·0	111·0	93·0	115	124	111	350	34·5	31·1	76·0	123	96·1	99·8	—	56·6	55·8	—	25·7	12·0	3·6	18·2
316	315	110·0	106·3	93·2	124	120	106	351	—	—	74·5	134·5	100·5	87·8	21·8	54·3	54·2	52·1	24·1	8·9	2·8	—
331	329	120·0	121·0	95·3	139	140	110	389	40·0	33·1	—	135	111·2	—	—	—	—	—	27·9	8·0	1·9	24·2
305	304	110·0	114·0	91·0	130	126	109	365	36·2	26·0	—	127·5	96·7	—	—	55·0	56·9	48·0	30·0	9·5	0·9	21·3
309	309	114·2	109·4	90·4	133	126	101	360	35·3	29·0	74·0	121	93·8	92·0	19·8	54·5	55·0	53·0	24·2	8·2	2·5	20·0
305	—	—	—	—	—	—	—	—	—	—	69·0	129·5	100·5	—	20·6	52·3	51·1	47·1	26·5	8·5	2·0	22·4
308	304	110·0	107·0	92·6	125	122	105	352	33·9	27·0	67·2	132·5	104·5	93·2	17·7	53·8	53·1	48·1	28·5	6·5	2·3	18·5
313	311	108·0	106·3	94·0	124	132	112	368	39·2	29·0	67·3	132	100·8	92·3	17·3	52·2	51·3	49·0	25·5	9·0	3·1	19·0
310	302	110·0	107·0	94·0	123	119	108	351	33·1	25·1	58·6	121·5?	91·4	85·2	12·0	47·4	47·4	47·2	24·8	10·0	3·1	20·8
302	300	107·3	104·8	89·0	121	119	103	343	32·5	26·9	63·2	128	97·3	92·1	17·3	46·2	47·0	45·6	24·5	11·5	3·2	24·0
307	300	105·2	110·1	89·7	120	126	105	352	31·9	26·5	69·0	127·5?	100·0	97·3	20·0	48·9	48·2	47·8	24·7	12·0	3·0	23·2
293	290	105·4	96·1	93·0	121	109	110	340	31·2	25·3	52·1	121?	91·3	83·9	11·4	41·0	41·2	40·0	21·5	8·6	1·3	19·0
296	296	108·0	112·0	87·0	123	124	108	355	32·3	24·1	58·2	120	92·5	87·8	16·6	43·5	43·1	40·0	22·2	—	—	20·6
—	—	—	—	—	—	—	—	—	32·0	26·8	64·1	120	93·0	94·1	18·0	45·6	45·7	44·1	24·1	10·4	2·1	22·4
—	—	108·2	115·6	91·8	—	—	—	—	34·9	29·8	69·2	125	103·2	100·2	18·2	53·1	53·1	49·9	25·2	9·6	3·3	21·1
323	320	113·8	112·1	92·1	134	129	110	373	36·4	28·7	61·0	125	98·2	87·9	15·9	47·0	47·0	45·0	24·9	10·2	3·0	24·0
301	294	100·0	110·6	85·0	112	126	101	339	34·5	27·0	66·0	127	98·0	95·0	18·5	46·0	46·0	47·5	21·9	10·1	2·5	21·6
297	293	105·0?	105·0?	95·2	120?	117?	112	349	30·5?	24·3	72·0	122	93·0	96·7	21·2	53·5	53·0	50·0	23·3	9·7	4·0	21·8
299	295	103·6	102·0	88·0	117	117	103	337	33·0	28·6	65·4	126·5	94·8	90·9	18·2	47·0	47·0	46·2	24·9	8·2	1·5	22·5
295	286	100·1	107·2	88·0	111	122	105	338	29·8	25·8	59·9	124	94·6	92·2	13·7	45·2	45·2	45·2	25·5	10·8	4·0	—
300	297	103·2	110·0	93·2	120	124	110	354	31·8	27·2	58·6	125	92·0	85·3	12·9	44·7	44·7	44·0	24·0	9·7	1·6	—
307	299	103·2	110·0	89·0	118	125	103	346	34·1	28·6	59·0	124	94·3	93·3	13·1?	46·3	46·9	44·7	25·0	12·5	2·9	27·7
332	320	111·8	116·0	99·0	126	131	113	370	30·5	25·3	65·3	121·5	96·0	97·0	18·2	49·0	48·4	44·5	23·5	10·3	3·2	21·0
317	312	109·6	108·9	96·0	128	124	111	363	33·5	31·0	62·1	123·5	97·1	84·6	15·2	49·0	49·0	45·7	23·1	10·9	3·8	25·6
301	296	102·1	101·1	91·8	118	115	106	339	33·1	26·1	67·1	128	96·2	84·9	15·5	52·8	51·5	51·2	25·2	11·9	3·7	24·2
292	284	103·0	99·2	95·5	112	110	112	334	—	—	62·0	—	97·0	92·7	—	48·9	49·5	47·0	25·4	—	—	23·1
—	—	103·4	110·0	90·0	119	123	102	344	33·9	28·0	65·0	119	92·1	87·3	—	—	50·0	—	27·0	9·0	1·5	22·6
—	—	108·2	108·0	89·7	122	122	107	351	32·0	26·9	62·3	121	92·4	91·3	17·9	46·8	48·0	46·0	24·5	6·2	1·8	21·5
—	—	—	—	—	—	—	—	—	33·0	—	60·0	125	—	96·0	—	—	—	49·0	23·0	—	—	—
—	—	—	—	—	—	—	—	—	33·0	—	61·0	122·5	—	95·0	—	—	—	47·0	22·0	—	—	—
—	—	—	—	—	—	—	—	—	34·0	—	58·0	125	—	85·0	—	—	—	48·0	22·5	—	—	—
—	—	—	—	—	—	—	—	—	30·6	—	57·0	127	—	90·0	—	—	—	56·0	23·0	—	—	—
301	294	103·2	102·8	85·3	119	119	96	333	28·7	25·0	58·1	115	95·0	86·4	14·9	43·1	43·1	43·0	23·0	6·9	1·4	19·3
301	294	106·0	95·0	92·2	118	105	108	331	32·1	25·0	64·2	119	90·0	91·3	17·0	45·8	46·0	45·7	23·9	11·0	2·1	22·4
288	282	99·6	99·0	85·0	115	113	97	326	37·0	28·0	55·2	118	85·3	83·4	13·2	42·0	42·0	42·0	18·8	6·9	2·0	—
296	292	102·1	106·8	86·1	117	125	96	338	29·5	25·3	56·5	118·5	82·0	88·1	10·2	45·6	44·5	43·1	22·9	7·0	2·0	20·4
297	290	100·0	104·0	95·0	110	118	108	336	29·1	26·6	59·0	115	85·8	90·0	15·1	43·2	43·2	43·7	22·1	12·0	3·7	21·6
285	280	97·8	103·0	89·0	110	117	101	328	32·2	28·0	58·0	117	96·1	89·0	15·0	43·0	43·0	43·0	24·9	12·0	2·0	24·8
302	297	106·0	101·5	88·0	123	114	101	338	32·0	28·4	56·0	120	90·3	85·9	14·8	41·9	42·0	42·8	22·3	9·1	2·5	22·1
304	295	103·0	108·0	87·0	118	123	99	340	33·5	27·2	61·8	116·5	89·1	92·5	14·2	42·5	42·8	43·9	22·5	10·0	2·1	21·7
—	—	—	—	—	—	—	—	—	32·2	28·0	61·5	119	94·5	83·0	19·0	46·2	47·0	45·0	23·1	9·1	2·1	21·0
300	296	103·9	91·4	88·0	119	101	101	321	33·2	29·2	62·8	124	92·2	93·0	18·2	44·0	43·9	43·0	23·8	12·0	2·5	21·8
—	—	104·0	97·5	93·4	118	107	112	337	33·1	28·9	58·2	116	92·3	85·7	14·5	46·0	46·0	43·6	23·8	7·5	2·0	19·5
—	—	95·3	99·8	87·0	109	111	104	324	31·0	27·5	—	—	93·5	—	—	43·0	43·9	42·3	23·5	10·6	2·5	21·4
		101·2	95·0	96·0	110	110																

TABELLE XXIX. *Schädelmasse—Dajaks und Andamanesen.*

DC	*DS*	*DA*	O_1R	$O_1'R$	*Lacr.* O_1R	O_2R	O_1L	$O_1'L$	*Lacr.* O_1L	O_2L	G_1	G_1'	G_2	*EH*	$P\angle$	*Pros.* $P\angle$	$100\,\frac{B}{L}$	$100\,\frac{H'}{L}$	$100\,\frac{B}{H'}$	$100\,\frac{B-H}{L}$
20·0	9·7	29·5	41·7	—	—	32·9	40·5	—	—	32·1	51·0	46·1	41·6	11·9	—	—	81·9	75·9	108·0	6·0
19·0	7·2	26·0	42·0	40·1	38·0	33·0	40·2	38·0	36·5	33·9	—	—	—	—	93°·3	90°·2	83·3	73·4	113·4	9·8
20·8	10·5	30·5	41·1	37·0	37·0	31·1	39·9	36·8	36·8	32·2	52·5	49·0	38·1	11·1	79°·5	77°·0	84·8	75·4	112·4	9·4
18·8	7·0	25·5	41·1	38·2	36·1	32·1	40·2	37·0	35·9	32·5	51·0	46·1	38·5	11·0	80°·7	80°·0	78·9	74·3	106·2	4·6
20·0	9·8	30·0	41·2	38·5	—	31·7	42·0	38·9	37·9	32·5	50·9	45·0	41·2	14·8	80°·0	77°·0	83·5	78·2	106·8	5·3
21·2	9·8	31·0	40·5	39·0	38·0	33·0	41·5	38·9	38·0	33·9	—	—	—	—	—	—	82·2	73·7	111·5	8·5
21·2	7·8	27·5	41·8	38·0	37·0	33·5	41·7	38·0	37·3	34·0	52·0	48·1	46·0	11·1	82°·9	81°·9	78·3	74·6	104·4	3·6
21·4	9·7	30·5	45·5	41·8	40·0	33·9	44·8	42·0	40·8	34·3	48·0	46·0	41·2	12·8	89°·8	88°·0	69·3	76·6	90·4	−7·3
22·7	8·0	29·5	45·0	41·9	40·1	35·2	44·1	41·3	40·2	35·9	—	—	—	—	—	—	79·3	73·2	108·4	6·2
16·0	8·0	24·0	39·2	36·3	36·3	35·0	39·1	37·0	35·9	35·8	—	—	—	—	—	—	78·7	77·0	102·3	1·7
22·8	7·2	29·5	45·5	42·0	39·3	32·5	46·1	40·7	39·5	32·5	—	—	—	—	—	—	87·3	78·0	111·9	9·3
21·3	7·4	28·5	41·8	39·6	38·0	33·9	39·5	37·5	36·9	34·2	51·4	47·0	40·2	10·4	82°·5	82°·1	71·6	76·0	94·2	−4·4
18·9	8·2	26·0	42·9	40·0	39·2	34·8	42·0	39·7	38·3	35·7	49·0	45·3	—	—	83°·0	81°·0	81·6	79·3	102·9	2·3
18·1	9·5	29·5	42·0	38·9	37·1	34·1	41·9	39·8	37·9	34·0	50·0	47·9	40·1	13·8	78°·8	76°·7	80·7	75·0	107·6	5·7
20·3	7·8	26·5	42·5	40·2	38·1	36·6	43·0	40·6	37·5	37·2	40·5	46·0	36·3	15·8	89°·0	88°·0	85·2	77·0	110·6	8·1
21·3	8·2	29·0	42·7	40·0	38·9	33·0	44·0	41·0	39·0	32·5	50·2	45·0	40·2	13·3	84°·5	84°·2	76·7	—	—	—
18·5	6·5	24·5	41·1	38·9	38·0	31·7	40·0	38·0	38·0	32·8	49·0	45·0	39·1	12·0	80°·8	79°·0	78·2	73·9	105·8	4·3
20·0	8·3	28·5	41·2	38·6	37·0	32·3	40·0	37·3	36·5	32·8	46·3	44·1	41·2	12·7	81°·8	81°·1	76·6	77·8	98·5	−1·2
18·5	7·3	28·0	46·0	43·2	42·6	39·6	46·0	43·6	42·7	39·2	45·6	42·2	35·8	11·0	92°·9	88°·6	77·4	80·6	96·1	−3·1
21·0	7·3	27·5	44·0	40·8	39·0	34·0	43·8	40·0	38·4	33·1	48·3	44·0	41·0	10·8	89°·8	85°·2	78·5	78·8	99·6	−0·3
18·5	5·1	24·0	41·9	40·8	39·4	32·5	42·9	39·8	39·0	33·0	50·0	45·9	42·5	15·5	83°·0	81°·4	75·4	77·7	97·1	−2·2
21·3	9·0	29·0	42·0	39·6	39·0	32·7	40·6	38·6	37·0	33·5	53·0	48·8	41·2	10·2	82°·9	81°·0	75·6	76·7	98·6	−1·1
24·0	7·9	32·0	44·1	41·4	39·8	36·2	43·8	40·0	39·0	36·5	48·0	44·7	42·9	10·8	83°·2	82°·8	78·7	78·1	100·7	0·6
24·3	7·0	29·0	42·0	39·4	37·2	31·0	42·1	39·5	37·4	31·5	49·3	43·5	40·0	14·0	89°·0	87°·1	79·4	76·9	103·3	2·6
21·2	7·9	28·0	41·0	38·0	36·8	33·0	40·3	37·9	36·5	31·9	52·1	49·2	38·5	13·8	84°·1	81°·3	78·4	75·3	104·2	3·1
19·0	7·2	26·0	42·3	—	—	36·3	42·2	—	—	34·2	—	—	—	—	—	—	—	—	—	—
—	—	—	41·0	—	—	33·0	41·0	—	—	32·2	—	—	—	—	—	—	73·7	—	—	—
22·0	7·9	29·0	45·3	43·4	—	37·5	45·0	42·3	41·4	37·0	46·7	43·8	44·2	12·8	84°·5	82°·2	77·7	75·0	103·7	2·7
22·5	9·3	30·5	39·8	37·1	36·3	32·5	40·0	37·0	36·5	31·8	—	—	—	—	—	—	85·9	81·0	106·0	4·8
23·2	10·3	33·0	43·0	40·0	40·0	33·0	43·0	39·8	39·8	33·0	52·5	48·1	41·0	12·1	82°·7	79°·8	81·8	—	—	—
22·3	6·5	28·0	44·0	41·6	39·8	34·3	43·1	40·3	39·5	34·3	52·0	47·0	—	—	86°·8	84°·5	71·4	74·6	95·7	−3·2
23·2	8·9	29·5	41·2	39·0	37·0	32·5	39·8	37·8	37·0	32·6	48·1	44·0	41·0	13·1	84°·5	83°·0	76·3	76·9	99·2	−0·6
21·0	7·3	29·5	40·8	38·0	37·0	33·3	41·0	38·6	37·2	33·6	51·5	47·1	39·0	12·0	80°·6	78°·0	75·0	70·3	106·6	4·7
18·2	10·8	28·0	41·9	40·0	39·2	35·5	41·0	39·0	38·0	35·0	—	—	42·2	12·2	83°·0	80°·6	71·1	75·1	94·6	−4·0
—	—	—	44·2	—	—	37·0	—	—	—	—	45·2	41·5	41·0	12·8	90°·9	88°·5	80·8	79·1	102·2	1·7
24·2	8·2	32·0	46·0	42·2	41·5	33·0	44·2	41·2	40·0	33·8	—	—	—	—	—	—	77·0	78·6	97·9	−1·6
21·3	6·3	27·0	45·2	41·3	39·3	32·5	43·7	39·2	38·0	32·9	—	—	—	—	86°·2	83°·4	73·1	73·9	98·9	−0·8
20·0	9·0	29·0	39·8	36·5	36·5	34·1	39·2	—	—	34·1	48·0	43·0	38·0	13·5	—	80°·0	80·1	84·0	95·4	−3·9
22·4	7·9	30·0	42·9	39·0	38·1	34·3	41·8	38·8	—	34·5	—	—	—	—	—	—	71·7	—	—	—
18·5	7·9	27·0	43·3	41·5	39·1	32·1	42·5	40·8	38·5	32·0	45·6	41·0	40·4	10·0	86°·5	85°·5	81·6	78·1	104·5	3·5
19·0	9·0	26·5	42·2	39·0	37·0	31·9	42·5	40·0	37·0	31·2	50·0	44·4	39·5	10·5	—	85°·5	77·5	79·2	97·8	−1·7
20·8	8·9	29·0	40·5	36·6	34·9	31·0	39·1	36·6	34·9	31·0	42·9	39·0	36·3	—	86°·7	84°·8	85·6	81·8	102·2	1·8
24·0	10·9	34·5	40·6	37·4	37·4	34·9	41·0	39·3	38·3	34·1	44·3	42·0	38·9	—	—	83°·1	82·7	74·4	111·2	8·3
23·2	10·2	34·0	39·5	37·0	37·0	33·4	39·2	36·4	36·4	33·9	49·3	47·3	38·7	12·0	79°·7	78°·0	82·6	78·7	104·9	3·9
20·6	9·0	29·0	39·8	38·0	36·5	33·1	39·1	37·3	35·5	32·9	42·2	39·9	36·4	8·2	88°·8	84°·4	82·6	75·0	110·2	7·6
22·4	11·4	36·0	41·0	38·1	36·8	33·1	40·8	37·0	37·0	32·8	50·0	45·2	34·9	9·0	81°·7	81°·7	78·4	77·8	100·7	0·6
21·1	10·5	34·0	40·0	37·0	37·0	35·0	38·3	35·2	35·2	34·1	51·1	47·2	39·0	14·0	80°·6?	79°·0	—	—	105·3	—
24·0	9·3	34·5	41·8	36·5	—	35·0	40·1	37·3	—	35·6	45·1	42·3	—	—	—	79°·4	78·4	75·3	104·2	3·2
21·6	10·3	34·0	40·5	37·3	—	33·7	41·6	37·8	37·8	32·4	47·5	45·3	38·3	13·0	84°·9	81°·0	81·9	80·5	101·8	1·4
21·8	9·0	30·0	39·2	36·9	—	33·0	37·3	36·0	34·4	33·1	48·0	44·5	33·5	13·1	—	82°·2	78·2	76·4	102·3	1·8
22·5	9·1	32·0	42·0	37·8	37·4	34·0	41·0	37·8	36·9	32·7	48·0	43·8	38·1	11·2	86°·3	79°·1	81·4	77·8	104·6	3·6
—	—	—	40·0	—	—	34·1	40·0	—	—	33·2	47·8	44·2	38·0	11·2	—	82°·4	80·7	75·9	106·3	4·8
—	—	—	41·9	—	—	31·8	40·0	—	—	31·2	43·8	40·4	36·0	10·2	85°·0	80°·9	82·4	76·4	107·9	6·1
17·7	9·0	35·0	43·0	38·3	38·3	30·7	41·0	37·5	36·1	32·4	49·1	45·0	—	—	—	81°·1	79·4	77·6	102·3	1·8
23·0	10·5	33·5	40·2	37·1	36·9	34·0	40·9	36·0	36·0	35·5	46·3	43·9	—	—	87°·0	82°·2	82·3	75·5	109·0	6·8
25·6	11·8	38·5	38·1	34·0	34·0	34·2	37·0	33·5	33·5	32·9	42·5	39·8	39·0	12·1	89°·5	85°·0	84·5	84·2	100·4	0·3
22·2	10·0	32·0	42·0	38·0	37·5	35·4	41·9	38·7	36·5	35·6	47·7	44·0	43·5	11·3	88°·7	87°·9	82·8	77·3	107·2	5·5
23·1	10·3	34·0	40·2	37·0	36·0	33·7	39·3	36·4	34·9	33·5	48·0	44·8	39·3	10·2	82°·0	88°·0	82·7	77·8	106·3	4·9
22·6	9·0	—	41·8	38·0	—	37·5	41·4	38·0	—	37·0	42·5?	—	—	—	—	78°·8	79·5	75·4	105·5	4·2
21·5	8·4	—	41·2	39·2	—	31·9	40·3	38·0	37·3	32·5	48·1	44·0	36·0	—	—	—	78·3	78·0	100·4	0·3
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	79·8	78·6	101·5	1·1
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80·1	78·9	101·6	1·2
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81·9	77·1	106·3	4·8
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	82·6	77·1	107·1	5·5
																	83·1	77·5	107·3	5·6
23·3	8·3	28·0	41·8	38·6	—	33·0	40·0	37·5	37·5	32·0	45·6	42·1	37·3	8·3	84°·0	82°·1	86·9	82·4	105·6	4·6
22·4	9·0	30·0	41·0	38·1	37·2	32·1	39·5	37·9	36·9	31·1	47·0	41·9	35·8	9·3	84°·9	82°·7	87·6	75·8	115·6	11·8
—	—	—	38·6	—	35·9	32·8	39·0	—	—	32·9	43·8	40·6	33·0	6·0?	85°·0	82°·0	81·1	78·3	103·6	2·8
22·4	9·0	27·5	39·0	36·9	36·9	33·0	40·0	37·0	35·0	33·0	44·8	42·0	33·1	11·9	84°·2	81°·2	82·5	79·4	103·9	3·1
23·6	12·5	36·0	37·9	35·0	35·0	33·4	37·5	35·0	35·0	30·4	44·9	43·6	35·0	6·0?	—	80°·0	83·5	79·4	105·2	4·1
23·8	10·0	35·0	38·5	35·0	—	30·6	39·0	35·2	35·1	33·1	45·5	42·6	36·5	9·1	80°·0	76°·3	83·8	77·1	108·7	6·7
24·1	7·5	28·0	38·8	35·8	—	32·5	38·3	35·1	35·0	32·0	41·7	38·1	34·9	7·1	—	87°·0	84·4	79·1	106·7	5·3
24·7	10·4	—	39·1	36·3	36·3	31·8	38·8	35·0	35·0	32·0	51·2	47·5	37·8	10·0	83°·9	80°·6	81·3	75·2	108·0	6·0
23·0	8·7	29·0	40·1	37·2	—	32·4	39·9	37·1	37·0	31·2	42·9	39·0	—	—	86°·2	82°·6	84·6	—	—	—
23·8	9·0	30·0	40·3	38·9	38·9	32·2	41·9	38·2	38·2	32·5	44·9	42·1	—	—	85°·1	82°·7	85·6	80·9	105·8	4·7
23·5	7·6	—	41·8	38·1	38·1	36·0	40·5	37·8	36·8	34·0	42·0	40·0	36·6	—	—	—	77·9	77·9	100·0	0·0
22·4	9·0	—	40·5	37·2	—	32·6	39·8	—	—	33·0	—	—	—	—	—	—	79·4	71·9	110·4	7·5
23·0	8·9	—	40·5	37·4	37·4	31·5	40·0	38·0	—	34·0	47·0	43·8	39·0	—	—	—	81·7	74·5	107·3	7·1

$\frac{B}{H'}$	$100\,\frac{B-H'}{L}$	*Oc. I.*	$100\,\frac{G'H}{GB}$	$100\,\frac{NB}{NHR}$	$100\,\frac{NB}{NH'}$	$100\,\frac{DS}{DC}$	$100\,\frac{SS}{SC}$	$100\,\frac{O_2}{O_1R}$	$100\,\frac{O_2}{O_1'R}$	$100\,\frac{O_2}{Lacr.\ O_1R}$	$100\,\frac{O_2}{O_1L}$	$100\,\frac{G_2}{G_1}$	$100\,\frac{G_2}{G_1'}$	I
o	6·0	78·1	66·9	52·1	54·0	48·5	35·3	78·9	—	—	79·3	81·6	90·2	
4	9·8	66·4	67·9	52·5	53·3	37·9	37·5	78·6	82·3	86·8	84·3	—	—	
4	9·4	59·7	64·5	56·5	60·6	50·5	43·3	75·7	84·1	84·1	80·7	72·6	77·8	
2	4·6	64·9	64·3	54·0	58·7	37·2	—	78·1	84·0	88·9	80·8	75·5	83·5	
8	5·3	61·0	70·3	43·8	46·0	49·0	51·7	76·9	82·3	—	77·4	80·9	91·6	
5	8·5	59·4	—	—	63·0	46·2	30·8	81·5	84·6	86·8	81·7	—	—	
4	3·6	63·4	75·2	46·6	49·3	36·8	47·1	80·1	88·2	90·5	81·5	88·5	95·6	
4	−7·3	60·8	66·2	53·9	57·8	45·3	40·4	74·5	81·1	84·8	76·6	85·8	89·6	
4	6·2	67·8	64·3	52·7	54·7	35·2	36·5	78·2	84·0	87·8	81·4	—	—	
3	1·7	61·8	—	50·7	51·7	50·0	39·2	89·3	96·4	96·4	91·6	—	—	
9	9·3	61·4	—	56·8	57·4	31·6	19·0	71·4	77·4	82·7	70·5	—	—	
2	−4·4	64·2	61·2	52·1	54·3	34·7	—	81·1	85·6	89·2	86·6	78·2	85·5	
9	2·3	68·9	73·3	53·0	54·1	43·4	45·1	81·1	87·0	88·8	85·0	—	—	
6	5·7	58·4	71·1	49·9	58·1	52·5	27·5	81·2	87·7	91·9	81·1	80·2	83·7	
6	8·1	64·5	77·8	46·8	49·2	38·4	—	86·1	91·0	96·1	86·5	73·3	78·9	
8	4·3	—	65·8	55·0	58·4	38·5	47·2	77·3	82·5	84·8	73·9	80·1	89·3	
5	−1·2	60·8	75·5	52·4	57·3	35·1	22·5	77·1	81·5	83·4	82·0	79·8	86·9	
1	−3·1	61·8	71·9	49·6	52·9	41·5	43·6	78·4	83·7	87·3	82·0	79·0	93·4	
6	−0·3	68·9	67·9	50·9	54·0	39·5	32·4	86·1	91·7	93·0	85·2	78·5	84·8	
1	−2·2	65·7	67·4	54·4	59·1	34·8	—	77·3	83·3	87·2	75·6	84·9	93·2	
6	−1·1	61·6	69·0	51·8	54·0	27·6	33·3	77·6	79·7	82·5	76·9	85·0	92·6	
7	0·6	63·5	70·1	52·1	53·5	42·3	43·3	77·9	82·6	83·8	82·5	77·7	84·4	
3	2·6	61·1	66·8	50·9	51·7	32·9	12·3	82·1	87·4	91·0	83·3	89·4	96·0	
2	3·1	61·8	64·8	51·3	54·8	28·8	21·0	73·8	78·7	83·3	74·8	81·1	92·0	
	—	60·0	69·3	54·3	58·7	37·3	34·1	80·5	86·8	89·7	79·3	73·9	78·3	
	—	—	60·9	50·9	51·0	37·9	—	85·8	—	—	81·0	—	—	
	—	—	—	—	56·0	—	24·8	80·5	—	—	78·5	—	—	
7	2·7	63·0	70·1	47·6	49·2	35·9	29·4	82·8	86·4	—	82·2	94·6	100·9	
0	4·8	62·2	—	52·4	56·3	41·3	38·2	81·7	87·6	89·5	79·5	—	—	
	—	—	72·1	47·2	51·9	44·4	27·3	76·7	82·5	82·5	76·7	78·1	85·2	
7	−3·2	56·0	68·3	51·1	54·1	29·1	27·1	78·0	82·5	86·2	79·6	—	—	
2	−0·6	59·2	67·3	51·5	51·6	38·4	20·9	78·9	83·3	87·8	81·9	85·2	93·2	
6	4·7	57·1	62·7	57·9	58·6	34·8	25·7	81·6	87·6	90·0	82·0	75·7	82·8	
6	−4·0	60·5	79·1	45·4	—	59·3	30·0	84·7	88·7	90·6	85·4	—	—	
2	1·7	66·9	74·2	44·4	46·3	—	31·5	83·7	—	—	—	90·7	98·8	
9	−1·6	64·5	—	—	—	33·9	23·8	71·7	78·2	79·5	76·5	—	—	
9	−0·8	60·2	—	54·5	62·5	29·6	9·5	71·9	78·7	82·7	75·3	—	—	
4	−3·9	70·4	78·9	44·4	45·7	45·0	30·5	85·7	93·4	93·4	87·0	79·2	88·4	
	—	—	68·7	50·7	56·3	35·3	23·5	80·0	87·9	90·0	82·5	—	—	
5	3·5	67·3	64·3	53·0	59·3	42·7	35·4	74·1	77·3	82·1	75·3	88·6	98·5	
8	−1·7	60·7	66·8	48·9	52·0	47·4	34·4	75·6	81·8	86·2	73·4	79·0	89·0	
2	1·8	65·1	64·1	52·3	52·5	42·8	31·0	76·5	84·7	88·8	79·3	84·6	93·1	
2	8·3	64·1	65·0	53·0	53·7	45·4	27·8	86·0	93·3	93·3	83·2	87·8	92·6	
9	3·9	62·6	69·0	50·5	51·7	44·0	25·0	84·6	90·3	90·3	86·5	78·5	81·8	
2	7·6	61·4	57·1	52·4	53·8	39·5	15·1	83·2	87·1	90·7	84·1	86·3	91·2	
7	0·6	57·5	62·9	51·0	55·5	43·7	—	78·6	84·1	—	80·4	83·5	89·7	
3	—	—	68·9	52·9	54·6	50·9	20·2	80·7	86·9	89·9	80·4	69·8	77·2	
2	3·2	—	67·1	47·5	50·5	49·8	34·4	87·5	94·6	94·6	89·0	76·3	82·6	
8	1·4	60·5	62·1	53·0	55·3	38·8	29·4	83·7	95·9	—	88·8	—	—	
3	1·8	61·0	67·3	47·6	46·1	47·7	24·8	83·2	90·4	—	77·9	80·6	84·5	
6	3·6	62·1	77·4	43·6	46·6	41·3	41·2	84·2	89·4	—	88·7	69·8	75·3	
3	4·8	62·7	69·0	53·0	53·9	40·4	18·3	81·0	89·9	90·9	79·8	79·4	87·0	
9	6·1	60·5	63·3	56·4	56·4	—	37·0	85·3	—	—	83·0	79·5	86·0	
3	1·8	61·7	63·7	53·7	54·5	—	16·5	75·9	—	—	78·0	82·2	89·1	
0	6·8	64·7	62·6	54·0	55·9	32·5	23·2	71·4	80·2	80·2	79·0	—	—	
4	0·3	66·1	68·0	48·0	52·8	50·0	31·1	84·6	91·6	92·1	86·8	—	—	
2	5·5	64·2	64·0	47·1	50·5	46·1	34·9	89·8	100·6	100·6	88·9	91·8	98·0	
3	4·9	63·8	69·8	47·7	49·2	41·3	31·1	84·3	93·2	94·4	85·0	91·2	98·9	
5	4·2	62·3	63·9	51·9	54·0	44·6	—	83·8	91·1	93·6	85·2	81·9	87·7	
4	0·3	67·5	70·6	—	—	39·8	16·7	89·7	98·7	—	89·4	—	—	
5	1·1	60·5	67·4	52·4	53·3	39·1	29·0	77·4	81·4	—	80·6	74·8	81·8	
6	1·2	—	—	—	46·9	—	—	—	—	—	—	—	—	
3	4·8	—	—	—	46·8	—	—	—	—	—	—	—	—	
1	5·5	—	—	—	46·9	—	—	—	—	—	—	—	—	
3	5·6	—	—	—	41·1	—	—	—	—	—	—	—	—	
6	4·6	68·7	61·2	53·4	53·5	43·0	20·3	78·9	85·5	—	80·0	81·8	88·6	
6	11·8	62·4	71·3	52·2	52·3	40·2	19·1	78·3	84·3	86·3	78·7	76·2	85·4	
6	2·8	65·4	64·7	44·8	44·8	—	29·0	85·0	—	91·4	84·4	75·3	81·3	
9	3·1	70·9	68·9	50·2	53·1	44·1	30·8	84·6	89·4	89·4	82·5	73·9	78·8	
2	4·1	66·9	61·4	51·2	50.6	57·9	16·7	88·1	95·4	95·4	81·1	78·0	80·3	
7	6·7	68·2	64·2	57·9	57·9	40·3	27·5	79·5	87·4	—	84·9	80·2	85·7	
7	5·3	65·3	62·9	53·2	52·1	33·9	21·0	83·8	90·8	—	83·6	83·7	91·6	
0	6·0	66·7	69·4	52·9	51·3	47·9	23·1	81·3	87·6	87·6	82·5	73·8	79·6	
	—	—	65·1	50·0	51·3	41·4	28·6	80·8	87·1	—	78·2	—	—	
8	4·7	65·3	68·1	54·1	55·3	41·3	20·8	79·9	82·8	82·8	77·6	—	—	
0	0·0	60·1	—	51·7	54·6	—	—	86·1	94·5	94·5	84·0	87·1	91·5	
4	7·5	60·4	—	54·7	55·6	—	—	80·5	87·6	—	82·9	—	—	
3	2·1	61·0	—	53·0	53·0	—	—	77·8	84·2	84·2	80·0	83·0	89·6	

O_2L	G_1	G_1'	G_2	EH	$P\angle$	*Pros.* $P\angle$	$100\frac{B}{L}$	$100\frac{H'}{L}$	$100\frac{B}{H'}$	$100\frac{B-H'}{L}$	*Oc. I.*	$100\frac{G'H}{GB}$	$100\frac{NB}{NHR}$	$100\frac{NB}{NH'}$	$100\frac{DS}{DC}$	$100\frac{SS}{SC}$	100
32·1	51·0	46·1	41·6	11·9	—	—	81·9	75·9	108·0	6·0	78·1	66·9	52·1	54·0	48·5	35·3	
33·9	—	—	—	—	93°·3	90°·2	83·3	73·4	113·4	9·8	66·4	67·9	52·5	53·3	37·9	37·5	
32·2	52·5	49·0	38·1	11·1	79°·5	77°·0	84·8	75·4	112·4	9·4	59·7	64·5	56·5	60·6	50·5	43·3	
32·5	51·0	46·1	38·5	11·0	80°·7	80°·0	78·9	74·3	106·2	4·6	64·9	64·3	54·0	58·7	37·2	—	
32·5	50·9	45·0	41·2	14·8	80°·0	77°·0	83·5	78·2	106·8	5·3	61·0	70·3	43·8	46·0	49·0	51·7	
33·9	—	—	—	—	—	—	82·2	73·7	111·5	8·5	59·4	—	—	63·0	46·2	30·8	
34·0	52·0	48·1	46·0	11·1	82°·9	81°·9	78·3	74·6	104·4	3·6	63·4	75·2	46·6	49·3	36·8	47·1	
34·3	48·0	46·0	41·2	12·8	89°·8	88°·0	69·3	76·6	90·4	−7·3	60·8	66·2	53·9	57·8	45·3	40·4	
35·9	—	—	—	—	—	—	79·3	73·2	108·4	6·2	67·8	64·3	52·7	54·7	35·2	36·5	
35·8	—	—	—	—	—	—	78·7	77·0	102·3	1·7	61·8	—	50·7	51·7	50·0	39·2	
32·5	—	—	—	—	—	—	87·3	78·0	111·9	9·3	61·4	—	56·8	57·4	31·6	19·0	
34·2	51·4	47·0	40·2	10·4	82°·5	82°·1	71·6	76·0	94·2	−4·4	64·2	61·2	52·1	54·3	34·7	—	
35·7	49·0	45·3	—	—	83°·0	81°·0	81·6	79·3	102·9	2·3	68·9	73·3	53·0	54·1	43·4	45·1	
34·0	50·0	47·9	40·1	13·8	78°·8	76°·7	80·7	75·0	107·6	5·7	58·4	71·1	49·9	58·1	52·5	27·5	
37·2	49·5	46·0	36·3	15·8	89°·0	88°·0	85·2	77·0	110·6	8·1	64·5	77·8	46·8	49·2	38·4	—	
32·5	50·2	45·0	40·2	13·3	84°·5	84°·2	76·7	—	—	—	—	65·8	55·0	58·4	38·5	47·2	
32·8	49·0	45·0	39·1	12·0	80°·8	79°·0	78·2	73·9	105·8	4·3	60·8	75·5	52·4	57·3	35·1	22·5	
32·8	46·3	44·1	41·2	12·7	81°·8	81°·1	76·6	77·8	98·5	−1·2	61·8	71·9	49·6	52·9	41·5	43·6	
39·2	45·6	42·2	35·8	11·0	92°·9	88°·6	77·4	80·6	96·1	−3·1	68·9	67·9	50·9	54·0	39·5	32·4	
33·1	48·3	44·0	41·0	10·8	89°·8	85°·2	78·5	78·8	99·6	−0·3	65·7	67·4	54·4	59·1	34·8	—	
33·0	50·0	45·9	42·5	15·5	83°·0	81°·4	75·4	77·7	97·1	−2·2	61·6	69·0	51·8	54·0	27·6	33·3	
33·5	53·0	48·8	41·2	10·2	82°·9	81°·0	75·6	76·7	98·6	−1·1	63·5	70·1	52·1	53·5	42·3	43·3	
36·5	48·0	44·7	42·9	10·8	83°·2	82°·8	78·7	78·1	100·7	0·6	61·1	66·8	50·9	51·7	32·9	12·3	
31·5	49·3	43·5	40·0	14·0	89°·0	87°·1	79·4	76·9	103·3	2·6	61·8	64·8	51·3	54·8	28·8	21·0	
31·9	52·1	49·2	38·5	13·8	84°·1	81°·3	78·4	75·3	104·2	3·1	60·0	69·3	54·3	58·7	37·3	34·1	
34·2	—	—	—	—	—	—	—	—	—	—	—	60·9	50·9	51·0	37·9	—	
32·2	—	—	—	—	—	—	73·7	—	—	—	—	—	—	56·0	—	24·8	
37·0	46·7	43·8	44·2	12·8	84°·5	82°·2	77·7	75·0	103·7	2·7	63·0	70·1	47·6	49·2	35·9	29·4	
31·8	—	—	—	—	—	—	85·9	81·0	106·0	4·8	62·2	—	52·4	56·3	41·3	38·2	
33·0	52·5	48·1	41·0	12·1	82°·7	79°·8	81·8	—	—	—	—	72·1	47·2	51·9	44·4	27·3	
34·3	52·0	47·0	—	—	86°·8	84°·5	71·4	74·6	95·7	−3·2	56·0	68·3	51·1	54·1	29·1	27·1	
32·6	48·1	44·0	41·0	13·1	84°·5	83°·0	76·3	76·9	99·2	−0·6	59·2	67·3	51·5	51·6	38·4	20·9	
33·6	51·5	47·1	39·0	12·0	80°·6	78°·0	75·0	70·3	106·6	4·7	57·1	62·7	57·9	58·6	34·8	25·7	
35·0	—	—	42·2	12·2	83°·0	80°·6	71·1	75·1	94·6	−4·0	60·5	79·1	45·4	—	59·3	30·0	
—	45·2	41·5	41·0	12·8	90°·9	88°·5	80·8	79·1	102·2	1·7	66·9	74·2	44·4	46·3	—	31·5	
33·8	—	—	—	—	—	—	77·0	78·6	97·9	−1·6	64·5	—	—	—	33·9	23·8	
32·9	—	—	—	—	86°·2	83°·4	73·1	73·9	98·9	−0·8	60·2	—	54·5	62·5	29·6	9·5	
34·1	48·0	43·0	38·0	13·5	—	80°·0	80·1	84·0	95·4	−3·9	70·4	78·9	44·4	45·7	45·0	30·5	
34·5	—	—	—	—	—	—	71·7	—	—	—	—	68·7	50·7	56·3	35·3	23·5	
32·0	45·6	41·0	40·4	10·0	86°·5	85°·5	81·6	78·1	104·5	3·5	67·3	64·3	53·0	59·3	42·7	35·4	
31·2	50·0	44·4	39·5	10·5	—	85°·5	77·5	79·2	97·8	−1·7	60·7	66·8	48·9	52·0	47·4	34·4	
31·0	42·9	39·0	36·3	—	86°·7	84°·8	83·6	81·8	102·2	1·8	65·1	64·1	52·3	52·5	42·8	31·0	
34·1	44·3	42·0	38·9	—	—	83°·1	82·7	74·4	111·2	8·3	64·1	65·0	53·0	53·7	45·4	27·8	
33·9	49·3	47·3	38·7	12·0	79°·7	78°·0	82·6	78·7	104·9	3·9	62·6	69·0	50·5	51·7	44·0	25·0	
32·9	42·2	39·9	36·4	8·2	88°·8	84°·4	82·6	75·0	110·2	7·6	61·4	57·1	52·4	53·8	39·5	15·1	
31·5	43·0	40·0	35·9	11·4	84°·0	81°·7	78·4	77·8	100·7	0·6	57·5	62·9	51·0	55·5	43·7	—	
32·8	50·0	45·2	34·9	9·0	81°·7	79°·0	—	—	105·3	—	—	68·9	52·9	54·6	50·9	20·2	
34·1	51·1	47·2	39·0	14·0	80°·6?	79°·4	78·4	75·3	104·2	3·2	—	67·1	47·5	50·5	49·8	34·4	
35·6	45·1	42·3	—	—	—	81°·0	81·9	80·5	101·8	1·4	60·5	62·1	53·0	55·3	38·8	29·4	
32·4	47·5	45·3	38·3	13·0	84°·9	82°·2	78·2	76·4	102·3	1·8	61·0	67·3	47·6	46·1	47·7	24·8	
33·1	48·0	44·5	33·5	13·1	—	79°·1	81·4	77·8	104·6	3·6	62·1	77·4	43·6	46·6	41·3	41·2	
32·7	48·0	43·8	38·1	11·2	86°·3	82°·4	80·7	75·9	106·3	4·8	62·7	69·0	53·0	53·9	40·4	18·3	
33·2	47·8	44·2	38·0	11·2	—	80°·9	82·4	76·4	107·9	6·1	60·5	63·3	56·4	56·4	—	37·0	
31·2	43·8	40·4	36·0	10·2	85°·0	81°·1	79·4	77·6	102·3	1·8	61·7	63·7	53·7	54·5	—	16·5	
32·4	49·1	45·0	—	—	—	82°·2	82·3	75·5	109·0	6·8	64·7	62·6	54·0	55·9	32·5	23·2	
35·5	46·3	43·9	—	—	87°·0	85°·0	84·5	84·2	100·4	0·3	66·1	68·0	48·0	52·8	50·0	31·1	
32·9	42·5	39·8	39·0	12·1	89°·5	87°·9	82·8	77·3	107·2	5·5	64·2	64·0	47·1	50·5	46·1	34·9	
35·6	47·7	44·0	43·5	11·3	88°·7	88°·0	82·7	77·8	106·3	4·9	63·8	69·8	47·7	49·2	41·3	31·1	
33·5	48·0	44·8	39·3	10·2	82°·0	78°·8	79·5	75·4	105·5	4·2	62·3	63·9	51·9	54·0	44·6	—	
37·0	42·5?	—	—	—	—	—	78·3	78·0	100·4	0·3	67·5	70·6	—	—	39·8	16·7	
32·5	48·1	44·0	36·0	—	—	—	79·8	78·6	101·5	1·1	60·5	67·4	52·4	53·3	39·1	29·0	
—	—	—	—	—	—	—	80·1	78·9	101·6	1·2	—	—	—	46·9	—	—	
—	—	—	—	—	—	—	81·9	77·1	106·3	4·8	—	—	—	46·8	—	—	
—	—	—	—	—	—	—	82·6	77·1	107·1	5·5	—	—	—	46·9	—	—	
—	—	—	—	—	—	—	83·1	77·5	107·3	5·6	—	—	—	41·1	—	—	
32·0	45·6	42·1	37·3	8·3	84°·0	82°·1	86·9	82·4	105·6	4·6	68·7	61·2	53·4	53·5	43·0	20·3	
31·1	47·0	41·9	35·8	9·3	84°·9	82°·7	87·6	75·8	115·6	11·8	62·4	71·3	52·2	52·3	40·2	19·1	
32·9	43·8	40·6	33·0	6·0?	85°·0	82°·0	81·1	78·3	103·6	2·8	65·4	64·7	44·8	44·8	—	29·0	
33·0	44·8	42·0	33·1	11·9	84°·2	81°·2	82·5	79·4	103·9	3·1	70·9	68·9	50·2	53·1	44·1	30·8	
30·4	44·9	43·6	35·0	6·0?	—	80°·0	83·5	79·4	105·2	4·1	66·9	61·4	51·2	50·6	57·9	16·7	
33·1	45·5	42·6	36·5	9·1	80°·0	76°·3	83·8	77·1	108·7	6·7	68·2	64·2	57·9	57·9	40·3	27·5	
32·0	41·7	38·1	34·9	7·1	—	87°·0	84·4	79·1	106·7	5·3	65·3	62·9	53·2	52·1	33·9	21·0	
32·0	51·2	47·5	37·8	10·0	83°·9	80°·6	81·3	75·2	108·0	6·0	66·7	69·4	52·9	51·3	47·9	23·1	
31·2	42·9	39·0	—	—	86°·2	82°·6	84·6	—	—	—	—	65·1	50·0	51·3	41·4	28·6	
32·5	44·9	42·1	—	—	85°·1	82°·7	85·6	80·9	105·8	4·7	65·3	68·1	54·1	55·3	41·3	20·8	
34·0	42·0	40·0	36·6	—	—	—	77·9	77·9	100·0	0·0	60·1	—	51·7	54·6	—	—	

100 $\frac{SS}{SC}$	100 $\frac{O_2}{O_1R}$	100 $\frac{O_2}{O_1'R}$	100 $\frac{O_2}{Lacr.\ O_1R}$	100 $\frac{O_2}{O_1L}$	100 $\frac{G_2}{G_1}$	100 $\frac{G_2}{G_1'}$	100 $\frac{fmb}{fml}$	$B\angle$	$A\angle$	$N\angle$	100 $\frac{EH}{G_2}$	
35·3	78·9	—	—	79·3	81·6	90·2	82·2	41°·8	73°·4	64°·8	28·6	Kerta Myama, natu
37·5	78·6	82·3	86·8	84·3	—	—	84·8	42°·5	77°·9	59°·6	—	Sahak, e gente Ban
43·3	75·7	84·1	84·1	80·7	72·6	77·8	84·3	39°·8	67°·1	73°·1	29·1	Atak, natus Soengi
—	78·1	84·0	88·9	80·8	75·5	83·5	95·6	36°·1	70°·1	73°·8	28·6	Amio? natus Korin
51·7	76·9	82·3	—	77·4	80·9	91·6	83·9	42°·3	69°·5	68°·2	35·9	Hadjie Moetamat,
30·8	81·5	84·6	86·8	81·7	—	—	82·4	—	—	—	—	Hadjie Heman, e g
47·1	80·1	88·2	90·5	81·5	88·5	95·6	84·7	42°·5	65°·8	71°·8	24·1	Manon, e gente Ba
40·4	74·5	81·1	84·8	76·6	85·8	89·6	93·4	38°·2	79°·0	62°·8	31·1	Penkeng Bapa Poey
36·5	78·2	84·0	87·8	81·4	—	—	82·9	41°·2	79°·2	59°·6	—	Talhah, natus Amo
39·2	89·3	96·4	96·4	91·6	—	—	82·1	—	—	—	—	Faloedin piscator,
19·0	71·4	77·4	82·7	70·5	—	—	90·0	—	—	—	—	Karnim, e gente Bu
—	81·1	85·6	89·2	86·6	78·2	85·5	76·1	36°·4	73°·8	60°·8	25·9	Dajak Inol, incola
45·1	81·1	87·0	88·8	85·0	—	—	82·7	44°·5	69°·8	65°·7	—	Aroem, natus Soeng
27·5	81·2	87·7	91·9	81·1	80·2	83·7	83·8	42°·9	66°·3	70°·8	34·4	Oetal, natus Mortar
—	86·1	91·0	96·1	86·5	73·3	78·9	78·8	47°·5	68°·6	63°·9	43·5	Moehamat Salet, e
47·2	77·3	82·5	84·8	73·9	80·1	89·3	—	—	—	—	33·1	Chef Kanapie de B
22·5	77·1	81·5	83·4	82·0	79·8	86·9	94·4	43°·5	66°·6	69°·9	30·7	Dajak van Sandak
43·6	78·4	83·7	87·3	82·0	79·0	93·4	77·6	44°·0	72°·7	63°·3	30·8	Pintjen, Dajak Kaj
32·4	86·1	91·7	93·0	85·2	78·5	84·8	89·1	41°·3	80°·9	57°·8	30·7	Igil Dajak, Ketoeng
—	77·3	83·3	87·2	75·6	84·9	93·2	80·4	37°·5	81°·6	60°·9	26·3	Sibi, Dajakshoofd,
33·3	77·6	79·7	82·5	76·9	85·0	92·6	75·1	39°·0	74°·0	67°·0	36·5	Tingga Dajak, Moe
43·3	77·9	82·6	83·8	82·5	77·7	84·4	83·8	40°·6	70°·4	69°·0	24·8	Parang Dajak, Moe
12·3	82·1	87·4	91·0	83·3	89·4	96·0	78·7	45°·0	69°·9	65°·1	25·2	Aloek Dajak, Kaba
21·0	73·8	78·7	83·3	74·8	81·1	92·0	84·8	43°·3	72°·6	64°·1	35·0	Borneo, misit Dr H
34·1	80·5	86·8	89·7	79·3	73·9	78·3	92·7	41°·4	67°·6	71°·0	35·8	Borneo, Schwaner,
—	85·8	—	—	81·0	—	—	—	—	—	—	—	Borneo, Schwaner.
24·8	80·5	—	—	78·5	—	—	—	—	—	—	—	Borneo, Schwaner.
29·4	82·8	86·4	—	82·2	94·6	100·9	81·8	45°·6	72°·1	62°·3	29·0	Demang Lehman, B
38·2	81·7	87·6	89·5	79·5	—	—	82·1	—	—	—	—	Djalil, Borneo. Ges
27·3	76·7	82·5	82·5	76·7	78·1	85·2	—	—	—	—	29·5	Mangon Yoeda, alia
27·1	78·0	82·5	86·2	79·6	—	—	80·4	42°·1	73°·2	64°·7	—	Dajak, Borneo, Dia
20·9	78·9	83·3	87·8	81·9	85·2	93·2	78·8	43°·4	73°·5	63°·1	32·0	Dajak, Borneo, Sch
25·7	81·6	87·6	90·0	82·0	75·7	82·8	96·3	38°·2	68°·4	73°·4	30·8	Djan, maniacus dici
30·0	84·7	88·7	90·6	85·4	—	—	90·1	45°·2	65°·7	69°·1	28·9	—— (Ohne Aufschr
31·5	83·7	—	—	—	90·7	98·8	—	45°·7	76°·9	57°·4	31·2	Dajak, stam der Ba
23·8	71·7	78·2	79·5	76·5	—	—	82·8	—	—	—	—	Dajak, stam der Ba
9·5	71·9	78·7	82·7	75·3	—	—	71·8	—	—	—	—	Dajak, van Sambas,
30·5	85·7	93·4	93·4	87·0	79·2	88·4	82·2	46°·6	69°·2	64°·2	35·5	Boesgoe, natus Pon
23·5	80·0	87·9	90·0	82·5	—	—	—	—	—	—	—	Incola Mahabahan,
35·4	74·1	77·3	82·1	75·3	88·6	98·5	79·6	40°·6	74°·5	64°·9	24·8	Dajak van Amonth
34·4	75·6	81·8	86·2	73·4	79·0	89·0	74·0	40°·5	76°·5	63°·0	26·6	Apoey Dajak, Beda
31·0	76·5	84·7	88·8	79·3	84·6	93·1	75·8	38°·2	77°·1	64°·7	—	
27·8	86·0	93·3	93·3	83·2	87·8	92·6	82·8	39°·9	70°·8	69°·3	—	
25·0	84·6	90·3	90·3	86·5	78·5	81·8	83·1	42°·3	65°·4	72°·3	31·0	
15·1	83·2	87·1	90·7	84·1	86·3	91·2	81·1	34°·3	79°·8	65°·9	22·5	
—	78·6	84·1	—	80·4	83·5	89·7	74·6	37°·3	76°·4	66°·3	31·8	
20·2	80·7	86·9	89·9	80·4	69·8	77·2	83·8	39°·3	71°·6	69°·1	25·8	
34·4	87·5	94·6	94·6	89·0	76·3	82·6	85·4	41°·4	65°·3	73°·3	35·9	
29·4	83·7	95·9	—	88·8	—	—	78·9	38°·9	76°·5	64°·6	—	
24·8	83·2	90·4	—	77·9	80·6	84·5	78·3	40°·2	71°·0	68°·8	33·9	
41·2	84·2	89·4	—	88·7	69·8	75·3	79·7	44°·3	65°·6	70°·1	39·1	
18·3	81·0	89·9	90·9	79·8	79·4	87·0	86·7	41°·4	71°·6	67°·0	29·4	
37·0	85·3	—	—	83·0	79·5	86·0	86·6	37°·7	71°·4	70°·9	29·5	
16·5	75·9	—	—	78·0	82·2	89·1	85·5	39°·0	74°·2	66°·8	28·3	
23·2	71·4	80·2	80·2	79·0	—	—	83·9	36°·4	72°·9	70°·7	—	
31·1	84·6	91·6	92·1	86·8	—	—	83·0	38°·2	74°·6	67°·2	—	
34·9	89·8	100·6	100·6	88·9	91·8	98·0	92·5	40°·8	76°·3	62°·9	31·0	
31·1	84·3	93·2	94·4	85·0	91·2	98·9	78·9	43°·7	75°·1	61°·2	26·0	
—	83·8	91·1	93·6	85·2	81·9	87·7	—	39°·1	70°·2	70°·7	26·0	
16·7	89·7	98·7	—	89·4	—	—	82·6	41°·3	75°·4	63°·3	—	
29·0	77·4	81·4	—	80·6	74·8	81·8	84·1	39°·5	71°·9	68°·6	—	
—	—	—	—	—	—	—	—	36°·6	70°·0	73°·4	—	
—	—	—	—	—	—	—	—	37°·8	67°·5	74°·6	—	
—	—	—	—	—	—	—	—	38°·0	76°·8	65°·2	—	
—	—	—	—	—	—	—	—	36°·4	71°·8	71°·8	—	
20·3	78·9	85·5	—	80·0	81·8	88·6	87·1	39°·1	70°·6	70°·3	22·3	
19·1	78·3	84·3	86·3	78·7	76·2	85·4	77·9	41°·2	68°·4	70°·4	26·0	
29·0	85·0	—	91·4	84·4	75·3	81·3	75·7	37°·0	77°·7	65°·3	18·2	
30·8	84·6	89·4	89·4	82·5	73·9	78·8	85·8	38°·1	73°·9	68°·0	36·0	
16·7	88·1	95·4	95·4	81·1	78·0	80·3	91·4	38°·7	69°·0	72°·3	17·1	
27·5	79·5	87·4	—	84·9	80·2	85·7	87·0	38°·6	68°·1	73°·3	24·9	
21·0	83·8	90·8	—	83·6	83·7	91·6	88·7	37°·1	75°·1	67°·8	20·3	
23·1	81·3	87·6	87·6	82·5	73·8	79·6	81·2	41°·8	68°·2	70°·0	26·5	
28·6	80·8	87·1	—	78·2	—	—	87·0	36°·0	78°·0	66°·0	—	
20·8	79·9	82·8	82·8	77·6	—	—	88·0	39°·5	69°·9	70°·6	—	
—	86·1	94·5	94·5	84·9	82·1	91·5	87·3	38°·4	74°·9	66°·7	—	

Kerta Myama, natus Banjermasin, Borneo. Geschenk van Dr Sonneman-Rebentisch, Swaving.
Sahak, e gente Banjermasin, natus Banjermasin, Borneo, Swaving-Z., Batavia, 10. ix. '61.
Atak, natus Soengi Coembo? e gente Banjermasin, Swaving-Z., Batavia, 24. vi. '60.
Amio? natus Korin, Banjermasin, Borneo, Swaving, Batavia, 29. vi. '60.
Hadjie Moetamat, e gente Banjermasin, Borneo, natus Pengaran, Swaving-Z., Batavia?
Hadjie Heman, e gente Banjermasin, natus Pengaran (Borneo), Swaving-Z., Batavia, 21. iv. '60.
Manon, e gente Banjermasin, natus Soengi Loembo (Borneo), Swaving-Z., Batavia, 21. iv. '60.
Penkeng Bapa Poeya, e gente Banjermasin, natus Poeloe Petak, Batavia, 3. i. '61.
Talhah, natus Amonthey Banjermasin, incola Palembangan, Borneo, Swaving-Z., Batavia, 21. ii. '62.
Faloedin piscator, natus Kampong Amboela prope Banjermasin, Swaving-Z., Batavia, 9. iii. '62.
Karnim, e gente Banjermasin, natus Pengaran (Borneo), Swaving-Z., Batavia, 9. iv. '60.
Dajak Inol, incola Moeweng (Banjermasin), Kapala Lampong, Swaving-Z., Batavia, 17. viii. '60.
Aroem, natus Soengi Katjiel, e gente Banjermasin (Borneo), Swaving-Z., Batavia, 17. viii. '60.
Oetal, natus Mortangoera, e gente Banjermasin, Batavia, 5. iv. '60, Swaving.
Moehamat Salet, e gente Banjermasin, natus Martapoera (Borneo), Swaving-Z., Batavia, 7. iv. '60.
Chef Kanapie de Bejadjoe Sajaks, rivière Kahajak (Borneo), Swaving-Z.
Dajak van Sandak (Borneo). Gezonden door Dr Vorstmann, Officier van Gezondheid, N.I., Mei 1892.
Pintjen, Dajak Kajan (W.-A. Borneo), man 45 jaar.
Igil Dajak, Ketoengan (W.-A. Borneo), man 35 jaar.
Sibi, Dajakshoofd, Mocalang (W.-A. Borneo), man 50 jaar.
Tingga Dajak, Mocalang W. Borneo, man 35 jaar.
Parang Dajak, Mocalang W. Borneo, man 25 jaar.
Aloek Dajak, Kabakan W. Borneo, man van 25 jaar.
Borneo, misit Dr Heppener, 1808.
Borneo, Schwaner, 1846.
Borneo, Schwaner.
Borneo, Schwaner.
Demang Lehman, Borneo Malapoera. Geexecuteerd 27. ii. '64 d or v. d. Bossche, Gouverneur van Sumatra's W
Djalil, Borneo. Geschenk van v. d. Bossche, Gouverneur van Sumatra's West-Kust, Mei 1867.
Mangon Yoeda, alias Kassim, Borneo. Geschenk van v. d. Bossche, Gouverneur van Sumatra's West-Kust, Me
Dajak, Borneo, Diard.
Dajak, Borneo, Schwaner.
Djan, maniacus dicitur Dajak anthropophagus, Batavia, 18. i. ?, Swaving-Z.
—— (Ohne Aufschrift).
Dajak, stam der Batang-Loepers, West-Kust Borneo. Geschenk van Dr Daniels, Officier van Gezondheid, Juni
Dajak, stam der Batang-Loepers. Geschenk van Dr Daniels, Officier van Gezondheid, Juni, 1879.
Dajak, van Sambas, Kapala Kampong. Geschenk van Dr Mohneke, Swaving-Z., Batavia, 1. viii. '62.
Boesgoe, natus Pontianak, Borneo. Swaving-Z., Batavia, 27. ii. '69.
Incola Mahabahan, e gente Dajak. Geschenk van den Heer Edeling, Swaving-Z.
Dajak van Amonthey. Gezonden door den Heer W. de Wall, Swaving-Z., Batavia, 17. xii. '61.
Apoey Dajak, Bedadjoe (Banjermasin), Swaving-Z., Batavia, 1862.

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ii. '62.
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'60.

ei 1892.

van Sumatra's West-Kust, Mei 1867.

's West-Kust, Mei 1867.

Gezondheid, Juni 1879.
879.
iii. '62.

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DAJAKS, MÄNNLICH		28	171	169·5	145	129	135·5	112·5	—	96·0	89·4	497	504	307	297
		29	175	172	138	130	131	111	—	99·1	95·0	504	506	308	301
		30	170	170	142	133	134	112	—	95·5	98·1	492	495	312	307
		32	165·5	166	136	122	123·5	105	—	92·2	91·3	481	484	297	296
		33	179·5	180	140·5	134	134·5	119	—	103·4	95·0	518	520	322	320
		34	184	181	127·5	141	140	117·5	—	107·1	95·0	496	509	304	305
		35	179	176·5	142	131	132	113·5	—	95·3	97·4	516	518	315	315
		37	171·5	169	135	132	133	113	—	96·5	80·0	484	489	309	304
		39	173	172·5	151	135	136	116	—	97·6	97·2	508	510	326	321
		42	181·5	180	130	138	140	116·5	—	102·5	90·0	497	505	307	305
		43	174	174	142	138	141	116	—	103·3	89·7	501	505	311	309
		44	176	175	142	132	133	114	—	96·0	90·1	508	515	316	314
		45	172	171	146·5	132·5	134	118·5	—	97·1	93·2	505	506	330	325
		46	172	172·5	132	—	—	116·5	—	—	92·3	483	490	308	304
		22 *a*	174	174	136	128·5	129·5	110·5	—	98·1	88·2	496	498	308	304
		22 *b*	168·5	168	129	131	132	110·5	—	94·0	92·7	479	482	292	290
		22 *c*	175	172	135·5	141	142	120·5	—	104·2	99·0	504	507	326	325
		22 *e*	172	171·5	135	135·5	136·5	112·5	—	105·0	97·0	493	496	304	297
		22 *f*	179	179·5	135	139	141	116	—	103·2	90·1	506	512	315	310
		22 *g*	180	179	136	138	139	117	—	104·0	90·8	505	506	313	310
		22 *h*	178	178	140	139	140	117	—	100·0	97·2	505	505	314	313
		1	175	173·5	139	134·5	133·5	114·5	—	96·0	94·2	509	512	316	314
		4	176	172·5	138	132·5	133	118·5	—	97·0	88·0	495	505	319	314
		5	175·5	174	—	—	—	—	—	—	87·3	495	499	—	—
		7	176·5	178	130	—	—	110	—	—	93·5	489	495	296	—
		8	184	182	143	138	138	114	—	99·6	102·0	526	530	320	320
		9	165·5	163	142	134	134	116	—	94·0	91·0	488	494	317	312
		10	174·5	172	142·5	—	—	121	—	—	96·2	502	510	326	319
		11	189	189·5	135	141	140	118·5	—	106·0	95·0	521	526	315	318
		14	173	171	132	133	136	111	—	95·3	97·1	487	500	298	294
		15	182	179·5	136·5	128	130	109	—	96·0	91·0	510	515	297	291
		16	173	173	123	130	132·5	109·5	—	97·1	94·0	481	485	291	288
		17	172	171·5	139	136	—	115·5	—	101·1	91·3	495	499	316	315
		18	184·5	185	142	145	146	122	—	105·2	101·4	529	530	331	329
		19	182	183	133	134·5	133·5	112	—	108·2	93·5	509	515	305	304
		24	166	165·5	133	139·5	137·5	117	—	95·0	90·8	478	480	309	309
		25	184	185	132	—	—	116	—	—	94·3	510	512	305	—
		36	171·5	168	140	134	134·5	111·5	—	99·2	89·0	491	495	308	304
		41	175·5	177·5	136	139	140	115	—	101·0	93·0	501	504	313	311
ANDAM JESEN — MÄNNLICH	R.C.S. F.C.	1202	165	165	138	135	135	116	115	92·0	90·0	480	479	310	302
		1205	168	166·5	139	125	125	110	109·5	93·0	92·2	487	489	302	300
		1205·3	167	168	138	131·5	134·5	115·5	113	93·0	83·4	476	485	307	300
		1205·5	164	163	135·5	123	122·5	107	106	90·1	89·7	472	469	293	290
		1206	171	172	134	133	133	110	110·5	93·0	90·0	490	485	296	296
		1207	—	—	139	132	133·5	115·5	114·5	95·7	91·0	—	—	—	—
		1211	174	173	136·5	131	132·5	117	114·5	95·0	94·0	—	—	—	—
		1216·1	174·5	171·5	143	140·5	140	115	119	94·2	100·4	502	505	323	320
		1217	167·5	—	131	128	128·5	111	110	96·2	92·4	475	472	301	294
	B.D.	1472	167	166	136	130	129·5	111·5	110·5	93·5	89·6	487	480	297	293
		1473	166	166	134	126	126·5	111	109·5	93·6	90·9	481	476	299	295
		1474	165	161·5	136	126	127·5	111	108	92·5	87·6	475	465	295	286
		1475	167·5	169	133	130	129	112	112	89·5	94·6	482	480	300	297
		1479	169·5	169·5	139·5	128	128·5	113·5	111·5	94·5	96·1	484	480	307	299
		1481	171	172	144·5	144	142·5	124	123·5	101·1	92·0	492	490	332	320
		1482	172	172	142·5	133	133	116	114	92·2	93·0	501	501	317	312
		1483	164·5	164·5	136	128	128·5	111	109	93·6	99·2	482	481	301	296
		1485	168·5	167	134	127	128	107	104	92·4	87·2	478	473	292	284
	B.M.	v. E. i	168	166	131·5	131	—	—	—	95·0	95·2	—	—	—	—
		5.11.25.1	168	166	134	132	—	—	—	93·1	93·0	—	—	—	—
	Oxf.	20/1038	161	160·5	129	127	—	—	—	94·0	92·5	—	—	—	—
		20/1040	166	164	136	128	—	—	—	91·0	97·0	—	—	—	—
		20/1	163·5	163	135	126	—	—	—	91·0	92·0	—	—	—	—
		20/4	160	159	133	124	—	—	—	90·0	93·0	—	—	—	—
WEIBLICH	R.C.S. F.C.	1203	153	153	133	126	125	111	110	86·5	92·7	457	461	301	294
		1205·2	161	161·5	141	122	121·5	106·5	106·5	90·0	90·0	471	473	301	294
		1205·4	159	160	129	124·5	—	103·5	103	89·2	91·0	460	464	288	282
		1213	160	160	132	127	126·5	110	108·5	91·4	90·4	457	457	296	292
		1214	158	156	132	125·5	126	111·5	109	88·0	90·7	452	459	297	290
		1215	157	157	131·5	121	—	105	103·5	86·1	94·0	456	459	285	280
		1216	160	161	135	126·5	—	110	110	89·6	89·0	464	465	302	297
		1218	165·5	165	134·5	124·5	—	109·5	110	91·2	86·0	474	477	304	295
		1212	162	162	137	—	—	107·5	105·5	89·0	86·2	—	—	—	—
	B.D.	1480	160	159	137	129·5	129	108	108	92·5	91·0	467	466	300	296
	B.M.	v. E. ii	163	162·5	127	127	—	—	—	90·0	92·3	—	—	—	—
		v. E. iii	160	160	127	115	—	—	—	86·3	91·6	—	—	—	—
		5.11.25.3	161	159	131·5	120	—	—	—	87·2	86·5	—	—	—	—
	Oxf.	20/1039	155	154·5	128·5	122	—	—	—	82·0	89·0	—	—	—	—
		20/1041	156	155	122·5	124	—	—	—	96·0	89·0	—	—	—	—
		20/2	157	157	130	119	—	—	—	86·0	79·0	—	—	—	—
		20/531	175	174·5	146	136·5	—	—	—	91·0	99·5	—	—	—	—

504	307	297	100·0	107·5	103·0	112	123	124	359	36·2	30·5	66·8	130	103·6	100·0	17·0	53·1	51·1	49·5	30·0	9·0
506	308	301	107·9	107·9	92·1	126	122	106	354	33·9	32·4	62·4	132·5	97·0	101·6	15·7	50·0	51·1	46·0	27·0	2·8
495	312	307	105·3	101·0	101·0	121	112	120	353	36·0	30·2	69·0	129·5	98·2	95·3	18·4	51·8	51·7	49·3	22·7	6·0
484	297	296	104·0	102·3	85·3	119	115	103	337	34·0	28·0	—	130·5	94·2	—	—	—	—	53·2	33·5	12·0
520	322	320	110·0	105·0	104·0	127	115	121	364	37·8	32·0	76·0	132·5	101·1	107·2	20·3	58·0	57·0	54·8	27·0	8·5
509	304	305	118·7	106·2	109·2	133	114	130	377	33·1	30·9	67·0	129·5	101·2	97·0	17·5	52·1	52·9	48·6	28·1	9·9
518	315	315	116·0	105·3	99·0	135	120	112	367	38·5	31·9	64·0	140	99·6	84·0	10·1	55·0	54·1	53·0	29·0	8·5
489	309	304	110·0	105·0	95·0	125	119	112	357	35·2	28·9	—	127·5	90·3	—	—	55·0	55·0	54·0	27·9	5·1
510	326	321	110·0	106·0	97·3	124	120	115	359	35·0	31·5	—	144·5	104·3	—	—	54·6	55·7	54·0	31·0	10·0
505	307	305	111·2	120·0	100·4	126	135	116	377	41·0	31·2	63·0	131	103·0	100·3	16·2	48·9	49·0	47·0	25·5	4·6
505	311	309	108·0	109·0	96·0	120	123	108	352	41·0	33·9	77·0	140	105·0	100·2	20·8	57·2	56·9	56·0	30·3	7·1
515	316	314	111·1	106·2	102·0	126	117	125	368	32·1	26·9	71·8	132	101·0	99·5	18·9	59·9	59·8	51·5	29·9	9·1
506	330	325	113·0	112·0	91·0	128	130	105	364	34·0	26·8	77·0	134·5	99·0	94·2	21·0	56·0	55·3	53·2	26·2	5·3
490	308	304	108·5	115·0	—	121	130	—	—	—	—	72·0	133	109·6	—	22·0	53·1	53·1	50·0	29·2	7·2
498	308	304	107·3	105·2	84·0	125	134	100	359	34·0	32·1	71·0	124·5	94·0	100·6	23·0	51·5	53·2	47·1	27·0	8·0
482	292	290	107·2	106·0	91·6	123	121	108	353	36·1	28·0	68·3	124	95·0	88·0	18·9	51·0	51·0	47·8	25·3	10·1
507	326	325	111·0	113·3	104·0	129	130	117	376	33·1	29·5	69·3	136	102·1	89·5	17·0	53·0	54·7	50·0	27·0	7·1
496	304	297	107·0	108·5	88·2	118	126	101	345	39·8	32·0	64·0	135·5	95·0	93·0	18·1	49·5	48·4	45·5	26·9	5·5
512	315	310	108·0	110·5	96·5	127	125	114	366	36·2	27·2	67·6	134	98·0	98·9	20·7	49·0	50·0	47·0	25·4	6·0
506	313	310	111·5	109·0	99·0	127	121	115	363	37·0	31·0	72·0	128·5	101·8	103·5	19·8	53·7	54·3	52·3	28·0	10·5
505	314	313	106·1	103·4	102·0	121	126	121	368	39·5	31·1	75·0	132	112·3	96·5	21·2	52·9	52·8	52·0	26·9	8·1
512	316	314	111·5	114·0	95·0	130	126	112	368	33·0	28·0	69·1	139	106·7	90·2	17·1	53·2	51·2	49·8	27·3	10·0
505	319	314	110·0	115·0	95·0	125	133	114	372	30·2	28·0	69·0	132·5	99·6	99·1	21·7	51·4	52·0	47·5	27·9	9·1
499	—	—	104·0	109·0	—	120	120	—	—	—	—	64·5	—	106·0	—	14·4	51·1	51·8	51·0	26·0	5·3
495	296	—	—	—	—	—	—	—	—	—	—	—	138	103·0	—	—	—	—	48·2	27·0	11·3
530	320	320	118·0	106·0	108·0	136	119	126	381	37·9	31·0	75·0	132	107·0	93·0	19·3	57·1	57·1	55·3	27·2	8·5
494	317	312	107·0	110·0	92·0	120	126	108	355	34·0	27·9	—	133	—	—	—	51·5	51·8	48·0	27·0	11·0
510	326	319	108·2	111·3	—	120	125	—	—	—	—	73·0	135	101·2	—	20·2	56·2	56·2	51·1	26·5	11·0
526	315	318	114·0	116·0	96·5	130	126	123	379	36·3	29·2	74·0	137	108·4	100·0	21·0	54·2	54·2	51·2	27·7	8·5
500	298	294	102·0	104·0	110·7	116	115	134	365	35·4	27·9	68·2	136	101·3	88·9	20·3	47·2	46·9	47·1	24·3	11·0
515	297	291	101·5	109·0	112·0	116	119	140	375	32·8	31·6	64·0	132	102·1	99·0	17·0	47·5	47·8	46·9	27·5	7·0
485	291	288	104·0	111·0	93·0	115	124	111	350	34·5	31·1	76·0	123	96·1	99·8	—	56·6	55·8	—	25·7	12·0
499	316	315	110·0	106·3	93·2	124	120	106	351	—	—	74·5	134·5	100·5	87·8	21·8	54·3	54·2	52·1	24·1	8·9
530	331	329	120·0	121·0	95·3	139	140	110	389	40·0	33·1	—	135	111·2	—	—	—	—	—	27·9	8·0
515	305	304	110·0	114·0	91·0	130	126	109	365	36·2	26·0	—	127·5	96·7	—	—	55·0	56·9	48·0	30·0	9·5
480	309	309	114·2	109·4	90·4	133	126	101	360	35·3	29·0	74·0	121	93·8	92·0	19·8	54·5	55·0	53·0	24·2	8·2
512	305	—	—	—	—	—	—	—	—	—	—	69·0	129·5	100·5	—	20·6	52·3	51·1	47·1	26·5	8·5
495	308	304	110·0	107·0	92·6	125	122	105	352	33·9	27·0	67·2	132·5	104·5	93·2	17·7	53·8	53·1	48·1	28·5	6·5
504	313	311	108·0	106·3	94·0	124	132	112	368	39·2	29·0	67·3	132	100·8	92·3	17·3	52·2	51·3	49·0	25·5	9·0
479	310	302	110·0	107·0	94·0	123	119	108	351	33·1	25·1	58·6	121·5?	91·4	85·2	12·0	47·4	47·4	47·2	24·8	10·0
489	302	300	107·3	104·8	89·0	121	119	103	343	32·5	26·9	63·2	128	97·3	92·1	17·3	46·2	47·0	45·6	24·5	11·5
485	307	300	105·2	110·1	89·7	120	126	105	352	31·9	26·5	69·0	127·5?	100·0	97·3	20·0	48·9	48·2	47·8	24·7	12·0
469	293	290	105·4	96·1	93·0	121	109	110	340	31·2	25·3	52·1	121?	91·3	83·9	11·4	41·0	41·2	40·0	21·5	8·6
485	296	296	108·0	112·0	87·0	123	124	108	355	32·3	24·1	58·2	120	92·5	87·8	16·6	43·5	43·1	40·0	22·2	—
—	—	—	—	—	—	—	—	—	—	32·0	26·8	64·1	120	93·0	94·1	18·0	45·6	45·7	44·1	24·1	10·4
—	—	—	108·2	115·6	91·8	—	—	—	—	34·9	29·8	69·2	125	103·2	100·2	18·2	53·1	53·1	49·9	25·2	9·6
505	323	320	113·8	112·1	92·1	134	129	110	373	36·4	28·7	61·0	125	98·2	87·9	15·9	47·0	47·0	45·0	24·9	10·2
472	301	294	100·0	110·6	85·0	112	126	101	339	34·5	27·0	66·0	127	98·0	95·0	18·5	46·0	46·0	47·5	21·9	10·1
480	297	293	105·0?	105·0?	95·2	120?	117?	112	349	30·5?	24·3	72·0	122	93·0	96·7	21·2	53·5	53·0	50·0	23·3	9·7
476	299	295	103·6	102·0	88·0	117	117	103	337	33·0	28·6	65·4	126·5	94·8	90·9	18·2	47·0	47·0	46·2	24·9	8·2
465	295	286	100·1	107·2	88·0	111	122	105	338	29·8	25·8	59·9	124	94·6	92·2	13·7	45·2	45·2	45·2	25·5	10·8
480	300	297	103·2	110·0	93·2	120	124	110	354	31·8	27·2	58·6	125	92·0	85·3	12·9	44·7	44·7	44·0	24·0	9·7
480	307	299	103·2	110·0	89·0	118	125	103	346	34·1	28·6	59·0	124	94·3	93·3	13·1?	46·3	46·9	44·7	25·0	12·5
490	332	320	111·8	116·0	99·0	126	131	113	370	30·5	25·3	65·3	121·5	96·0	97·0	18·2	49·0	48·4	44·5	23·5	10·3
501	317	312	109·6	108·9	96·0	128	124	111	363	33·5	31·0	62·1	123·5	97·1	84·6	15·2	49·0	49·0	45·7	23·1	10·9
481	301	296	102·1	101·1	91·8	118	115	106	339	33·1	26·1	67·1	128	96·2	84·9	15·5	52·8	51·5	51·2	25·2	11·9
473	292	284	103·0	99·2	95·5	112	110	112	334	—	—	62·0	—	97·0	92·7	—	48·9	49·5	47·0	25·4	—
—	—	—	103·4	110·0	90·0	119	123	102	344	33·9	28·0	65·0	119	92·1	87·3	—	—	50·0	—	27·0	9·0
—	—	—	108·2	108·0	89·7	122	122	107	351	32·0	26·9	62·3	121	92·4	91·3	17·9	46·8	48·0	46·0	24·5	6·2
—	—	—	—	—	—	—	—	—	—	33·0	—	60·0	125	—	96·0	—	—	—	49·0	23·0	—
—	—	—	—	—	—	—	—	—	—	33·0	—	61·0	122·5	—	95·0	—	—	—	47·0	22 0	—
—	—	—	—	—	—	—	—	—	—	34·0	—	58·0	125	—	85·0	—	—	—	48·0	22·5	—
—	—	—	—	—	—	—	—	—	—	30·6	—	57·0	127	—	90·0	—	—	—	56·0	23·0	—
61	301	294	103·2	102·8	85·3	119	119	96	333	28·7	25·0	58·1	115	95·0	86·4	14·9	43·1	43·1	43·0	23·0	6·9
73	301	294	106·0	95·0	92·2	118	105	108	331	32·1	25·0	64·2	119	90·0	91·3	17·0	45·8	46·0	45·7	23·9	11·0
64	288	282	99·6	99·0	85·0	115	113	97	326	37·0	28·0	55·2	118	85·3	83·4	13·2	42·0	42·0	42·0	18·8	6·9
57	296	292	102·1	106·8	86·1	117	125	96	338	29·5	25·3	56·5	118·5	82·0	88·1	10·2	45·6	44·5	43·1	22·9	7·0
59	297	290	100·0	104·0	95·0	110	118	108	336	29·1	26·6	59·0	115	85·8	90·0	15·1	43·2	43·2	43·7	22·1	12·0
59	285	280	97·8	103·0	89·0	110	117	101	328	32·2	28·0	58·0	117	96·1	89·0	15·0	43·0	43·0	43·0	24·9	12·0
65	302	297	106·0	101·5	88·0	123	114	101	338	32·0	28·4	56·0	120	90·3	85·9	14·8	41·9	42·0	42·8	22·3	9·1
77	304	295	103·0	108·0	87·0	118	123	99	340	33·5	27·2	61·8	116·5	89·1	92·5	14·2	42·5	42·8	43·9	22·5	10·0
—	—	—	—	—	—	—	—	—	—	32·2	28·0	61·5	119	94·5	83·0	19·0	46·2	47·0	45·0	23·1	9·1
66	300	296	103·9	91·4	88·0	119	101	101	321	33·2	29·2	62·8	124	92·2	93·0	18·2	44·0	43·9	43·0	23·8	12·0
—	—	—	104·0	97·5	93·4	118	107	112	337	33·1	28·9	58·2	116	92·3	85·7	14·5	46·0	46·0	43·6	23·8	7·5
—	—	—	95·3	99·8	87·0	109	111	104	324	31·0	27·5	—	—	93·5	—	—	43·0	43·0	42·3	23·5	10·6
—	—	—	101·3	95·0	96·0	110	110	114	334	32·9	29·0	57·0	119	85·0	87·1	15·2	43·2	44·0	43·2	22·9	6·0
—	—	—	—	—	—	—	—	—	—	31·0	—	54·0	109	—	82·0	—	—	—	41·0	23·0	—
—	—	—	—	—	—	—	—	—	—	32·5	—	52·0	108·5	—	81·5	—	—	—	39·0	20·5	—
—	—	—	—	—	—	—	—	—	—	32·0	—	57·0	107	—	92·5	—	—	—	42·0	22·0	—
—	—	—	—	—	—	—	—	—	—	31·0	—	60·0	122	—	91·0	—	—	—	47·0	24·0	—

9·0	3·9	2·8	10·5	30·5	41·1	37·0	37·0	31·1	39·9	36·8	36·8	32·2	52·5	49·0	38·1	11·1	79°·5	77°·0	84·8	75·4	112·4
2·8	—	18·8	7·0	25·5	41·1	38·2	36·1	32·1	40·2	37·0	35·9	32·5	51·0	46·1	38·5	11·0	80°·7	80°·0	78·9	74·3	106·2
6·0	3·1	20·0	9·8	30·0	41·2	38·5	—	31·7	42·0	38·9	37·9	32·5	50·9	45·0	41·2	14·8	80°·0	77°·0	83·5	78·2	106·8
12·0	3·7	21·2	9·8	31·0	40·5	39·0	38·0	33·0	41·5	38·9	38·0	33·9	—	—	—	—	—	—	82·2	73·7	111·5
8·5	4·0	21·2	7·8	27·5	41·8	38·0	37·0	33·5	41·7	38·0	37·3	34·0	52·0	48·1	46·0	11·1	82°·9	81°·9	78·3	74·6	104·4
9·9	4·0	21·4	9·7	30·5	45·5	41·8	40·0	33·9	44·8	42·0	40·8	34·3	48·0	46·0	41·2	12·8	89°·8	88°·0	69·3	76·6	90·4
8·5	3·1	22·7	8·0	29·5	45·0	41·9	40·1	35·2	44·1	41·3	40·2	35·9	—	—	—	—	—	—	79·3	73·2	108·4
5·1	2·0	16·0	8·0	24·0	39·2	36·3	36·3	35·0	39·1	37·0	35·9	35·8	—	—	—	—	—	—	78·7	77·0	102·3
10·0	1·9	22·8	7·2	29·5	45·5	42·0	39·3	32·5	46·1	40·7	39·5	32·5	—	—	—	—	—	—	87·3	78·0	111·9
4·6	—	21·3	7·4	28·5	41·8	39·6	38·0	33·9	39·5	37·5	36·9	34·2	51·4	47·0	40·2	10·4	82°·5	82°·1	71·6	76·0	94·2
7·1	3·2	18·9	8·2	26·0	42·9	40·0	39·2	34·8	42·0	39·7	38·3	35·7	49·0	45·3	—	—	83°·0	81°·0	81·6	79·3	102·9
9·1	2·5	18·1	9·5	29·5	42·0	38·9	37·1	34·1	41·9	39·8	37·9	34·0	50·0	47·9	40·1	13·8	78°·8	76°·7	80·7	75·0	107·6
5·3	—	20·3	7·8	26·5	42·5	40·2	38·1	36·6	43·0	40·6	37·5	37·2	49·5	46·0	36·3	15·8	89°·0	88°·0	85·2	77·0	110·6
7·2	3·4	21·3	8·2	29·0	42·7	40·0	38·9	33·0	44·0	41·0	39·0	32·5	50·2	45·0	40·2	13·3	84°·5	84°·2	76·7	—	—
8·0	1·8	18·5	6·5	24·5	41·1	38·9	38·0	31·7	40·0	38·0	38·0	32·8	49·0	45·0	39·1	12·0	80°·8	79°·0	78·2	73·9	105·8
10·1	4·4	20·0	8·3	28·5	41·2	38·6	37·0	32·3	40·0	37·3	36·5	32·8	46·3	44·1	41·2	12·7	81°·8	81°·1	76·6	77·8	98·5
7·1	2·3	18·5	7·3	28·0	46·0	43·2	42·6	39·6	46·0	43·6	42·7	39·2	45·6	42·2	35·8	11·0	92°·9	88°·6	77·4	80·6	96·1
5·5	—	21·0	7·3	27·5	44·0	40·8	39·0	34·0	43·8	40·0	38·4	33·1	48·3	44·0	41·0	10·8	89°·8	85°·2	78·5	78·8	99·6
6·0	2·0	18·5	5·1	24·0	41·9	40·8	39·4	32·5	42·9	39·8	39·0	33·0	50·0	45·9	42·5	15·5	83°·0	81°·4	75·4	77·7	97·1
10·5	4·5	21·3	9·0	29·0	42·0	39·6	39·0	32·7	40·6	38·6	37·0	33·5	53·0	48·8	41·2	10·2	82°·9	81°·0	75·6	76·7	98·6
8·1	1·0	24·0	7·9	32·0	44·1	41·4	39·8	36·2	43·8	40·0	39·0	36·5	48·0	44·7	42·9	10·8	83°·2	82°·8	78·7	78·1	100·7
10·0	2·1	24·3	7·0	29·0	42·0	39·4	37·2	31·0	42·1	39·5	37·4	31·5	49·3	43·5	40·0	14·0	89°·0	87°·1	79·4	76·9	103·3
9·1	3·1	21·2	7·9	28·0	41·0	38·0	36·8	33·0	40·3	37·9	36·5	31·9	52·1	49·2	38·5	13·8	84°·1	81°·3	78·4	75·3	104·2
5·3	—	19·0	7·2	26·0	42·3	—	—	36·3	42·2	—	—	34·2	—	—	—	—	—	—	—	—	—
11·3	2·8	—	—	—	41·0	—	—	33·0	41·0	—	—	32·2	—	—	—	—	—	—	73·7	—	—
8·5	2·5	22·0	7·9	29·0	45·3	43·4	—	37·5	45·0	42·3	41·4	37·0	46·7	43·8	44·2	12·8	84°·5	82°·2	77·7	75·0	103·7
11·0	4·2	22·5	9·3	30·5	39·8	37·1	36·3	32·5	40·0	37·0	36·5	31·8	—	—	—	—	—	—	85·9	81·0	106·0
11·0	3·0	23·2	10·3	33·0	43·0	40·0	40·0	33·0	43·0	39·8	39·8	33·0	52·5	48·1	41·0	12·1	82°·7	79°·8	81·8	—	—
8·5	2·3	22·3	6·5	28·0	44·0	41·6	39·8	34·3	43·1	40·3	39·5	34·3	52·0	47·0	—	—	86°·8	84°·5	71·4	74·6	95·7
11·0	2·3	23·2	8·9	29·5	41·2	39·0	37·0	32·5	39·8	37·8	37·0	32·6	48·1	44·0	41·0	13·1	84°·5	83°·0	76·3	76·9	99·2
7·0	1·8	21·0	7·3	29·5	40·8	38·0	37·0	33·3	41·0	38·6	37·2	33·6	51·5	47·1	39·0	12·0	80°·6	78°·0	75·0	70·3	106·6
12·0	3·6	18·2	10·8	28·0	41·9	40·0	39·2	35·5	41·0	39·0	38·0	35·0	—	—	42·2	12·2	83°·0	80°·6	71·1	75·1	94·6
8·9	2·8	—	—	—	44·2	—	—	37·0	—	—	—	—	45·2	41·5	41·0	12·8	90°·9	88°·5	80·8	79·1	102·2
8·0	1·9	24·2	8·2	32·0	46·0	42·2	41·5	33·0	44·2	41·2	40·0	33·8	—	—	—	—	—	—	77·0	78·6	97·9
9·5	0·9	21·3	6·3	27·0	45·2	41·3	39·3	32·5	43·7	39·2	38·0	32·9	—	—	—	—	86°·2	83°·4	73·1	73·9	98·9
8·2	2·5	20·0	9·0	29·0	39·8	36·5	36·5	34·1	39·2	—	—	34·1	48·0	43·0	38·0	13·5	—	80°·0	80·1	84·0	95·4
8·5	2·0	22·4	7·9	30·0	42·9	39·0	38·1	34·3	41·8	38·8	—	34·5	—	—	—	—	—	—	71·7	—	—
6·5	2·3	18·5	7·9	27·0	43·3	41·5	39·1	32·1	42·5	40·8	38·5	32·0	45·6	41·0	40·4	10·0	86°·5	85°·5	81·6	78·1	104·5
9·0	3·1	19·0	9·0	26·5	42·2	39·0	37·0	31·9	42·5	40·0	37·0	31·2	50·0	44·4	39·5	10·5	—	85°·5	77·5	79·2	97·8
10·0	3·1	20·8	8·9	29·0	40·5	36·6	34·9	31·0	39·1	36·6	34·9	31·0	42·9	39·0	36·3	—	86°·7	84°·8	83·6	81·8	102·2
11·5	3·2	24·0	10·9	34·5	40·6	37·4	37·4	34·9	41·0	39·3	38·3	34·1	44·3	42·0	38·9	—	—	83°·1	82·7	74·4	111·2
12·0	3·0	23·2	10·2	34·0	39·5	37·0	37·0	33·4	39·2	36·4	36·4	33·9	49·3	47·3	38·7	12·0	79°·7	78°·0	82·6	78·7	104·9
8·6	1·3	19·0	7·5	27·0	39·8	38·0	36·5	33·1	39·1	37·3	35·5	32·9	42·2	39·9	36·4	8·2	88°·8	84°·4	82·6	75·0	110·2
—	—	20·6	9·0	29·0	39·8	37·3	—	31·3	39·2	37·5	—	31·5	43·0	40·0	35·9	11·4	84°·0	81°·7	78·4	77·8	100·7
10·4	2·1	22·4	11·4	36·0	41·0	38·1	36·8	33·1	40·8	37·0	37·0	32·8	50·0	45·2	34·9	9·0	81°·7	79°·0	—	—	105·3
9·6	3·3	21·1	10·5	34·0	40·0	37·0	37·0	35·0	38·3	35·2	35·2	34·1	51·1	47·2	39·0	14·0	80°·6?	79°·4	78·4	75·3	104·2
10·2	3·0	24·0	9·3	34·5	41·8	36·5	—	35·0	40·1	37·3	—	35·6	45·1	42·3	—	—	—	81°·0	81·9	80·5	101·8
10·1	2·5	21·6	10·3	34·0	40·5	37·3	—	33·7	41·6	37·8	37·8	32·4	47·5	45·3	38·3	13·0	84°·9	82°·2	78·2	76·4	102·3
9·7	4·0	21·8	9·0	30·0	39·2	36·9	—	33·0	37·3	36·0	34·4	33·1	48·0	44·5	33·5	13·1	—	79°·1	81·4	77·8	104·6
8·2	1·5	22·5	9·1	32·0	42·0	37·8	37·4	34·0	41·0	37·8	36·9	32·7	48·0	43·8	38·1	11·2	86°·3	82°·4	80·7	75·9	106·3
10·8	4·0	—	—	—	40·0	—	—	34·1	40·0	—	—	33·2	47·8	44·2	38·0	11·2	—	80°·9	82·4	76·4	107·9
9·7	1·6	—	—	—	41·9	—	—	31·8	40·0	—	—	31·2	43·8	40·4	36·0	10·2	85°·0	81°·1	79·4	77·6	102·3
12·5	2·9	27·7	9·0	35·0	43·0	38·3	38·3	30·7	41·0	37·5	36·1	32·4	49·1	45·0	—	—	—	82°·2	82·3	75·5	109·6
10·3	3·2	21·0	10·5	33·5	40·2	37·1	36·9	34·0	40·9	36·0	36·0	35·5	46·3	43·9	—	—	87°·0	85°·0	84·5	84·2	100·4
10·9	3·8	25·6	11·8	38·5	38·1	34·0	34·0	34·2	37·0	33·5	33·5	32·9	42·5	39·8	39·0	12·1	89°·5	87°·9	82·8	77·3	107·2
11·9	3·7	24·2	10·0	32·0	42·0	38·0	37·5	35·4	41·9	38·7	36·5	35·6	47·7	44·0	43·5	11·3	88°·7	88°·0	82·7	77·8	106·3
—	—	23·1	10·3	34·0	40·2	37·0	36·0	33·7	39·3	36·4	34·9	33·5	48·0	44·8	39·3	10·2	82°·0	78°·8	79·5	75·4	105·5
9·0	1·5	22·6	9·0	—	41·8	38·0	—	37·5	41·4	38·0	—	37·0	42·5?	—	—	—	—	—	78·3	78·0	100·
6·2	1·8	21·5	8·4	—	41·2	39·2	—	31·9	40·3	38·0	37·3	32·5	48·1	44·0	36·0	—	—	—	79·8	78·6	101·5
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	80·1	78·9	101·4
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	81·9	77·1	106·
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	82·6	77·1	107·
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	83·1	77·5	107·
6·9	1·4	19·3	8·3	28·0	41·8	38·6	—	33·0	40·0	37·5	37·5	32·0	45·6	42·1	37·3	8·3	84°·0	82°·1	86·9	82·4	105·6
11·0	2·1	22·4	9·0	30·0	41·0	38·1	37·2	32·1	39·5	37·9	36·9	31·1	47·0	41·9	35·8	9·3	84°·9	82°·7	87·6	75·8	115·6
6·9	2·0	—	—	—	38·6	—	35·9	32·8	39·0	—	—	32·9	43·8	40·6	33·0	6·0?	85°·0	82°·0	81·1	78·3	103·
7·0	2·0	20·4	9·0	27·5	39·0	36·9	36·9	33·0	40·0	37·0	35·0	33·0	44·8	42·0	33·1	11·9	84°·2	81°·2	82·5	79·4	103·
12·0	3·7	21·6	12·5	36·0	37·9	35·0	35·0	33·4	37·5	35·0	35·0	30·4	44·9	43·6	35·0	6·0?	—	80°·0	83·5	79·4	105·
12·0	2·0	24·8	10·0	35·0	38·5	35·0	—	30·6	39·0	35·2	35·1	33·1	45·5	42·6	36·5	9·1	80°·0	76°·3	83·8	77·1	108·
9·1	2·5	22·1	7·5	28·0	38·8	35·8	—	32·5	38·3	35·1	35·0	32·0	41·7	38·1	34·9	7·1	—	87°·0	84·4	79·1	106·
10·0	2·1	21·7	10·4	—	39·1	36·3	36·3	31·8	38·8	35·0	35·0	32·0	51·2	47·5	37·8	10·0	83°·9	80°·6	81·3	75·2	108·
9·1	2·1	21·0	8·7	29·0	40·1	37·2	—	32·4	39·9	37·1	37·0	31·2	42·9	39·0	—	—	86°·2	82°·6	84·6	—	—
12·0	2·5	21·8	9·0	30·0	40·3	38·9	38·9	32·2	41·9	38·2	38·2	32·5	44·9	42·1	—	—	85°·1	82°·7	85·6	80·9	105·
7·5	2·0	19·5	7·6	—	41·8	38·1	38·1	36·0	40·5	37·8	36·8	34·0	42·0	40·0	36·6	—	—	—	77·9	77·9	100·
10·6	2·5	21·4	9·0	—	40·5	37·2	—	32·6	39·8	—	—	33·0	—	—	—	—	—	—	79·4	71·9	110·
6·0	2·0	17·0	8·9	—	40·5	37·4	37·4	31·5	40·0	38·0	—	32·0	47·0	43·8	39·0	—	—	—	81·7	74·5	107·
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	82·9	78·7	105·
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	78·5	79·5	98·
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	82·8	75·8	109·
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	83·4	78·0	107·

75·4	112·4	9·4	59·7	64·3	50·3	58·6	30·5	43·3	75·7	84·1	84·1	80·7	75·0
74·3	106·2	4·6	64·9	64·3	54·0	58·7	37·2	—	78·1	84·0	88·9	80·8	75·5
78·2	106·8	5·3	61·0	70·3	43·8	46·0	49·0	51·7	76·9	82·3	—	77·4	80·9
73·7	111·5	8·5	59·4	—	—	63·0	46·2	30·8	81·5	84·6	86·8	81·7	—
74·6	104·4	3·6	63·4	75·2	46·6	49·3	36·8	47·1	80·1	88·2	90·5	81·5	88·5
76·6	90·4	−7·3	60·8	66·2	53·9	57·8	45·3	40·4	74·5	81·1	84·8	76·6	85·8
73·2	108·4	6·2	67·8	64·3	52·7	54·7	35·2	36·5	78·2	84·0	87·8	81·4	—
77·0	102·3	1·7	61·8	—	50·7	51·7	50·0	39·2	89·3	96·4	96·4	91·6	—
78·0	111·9	9·3	61·4	—	56·8	57·4	31·6	19·0	71·4	77·4	82·7	70·5	—
76·0	94·2	−4·4	64·2	61·2	52·1	54·3	34·7	—	81·1	85·6	89·2	86·6	78·2
79·3	102·9	2·3	68·9	73·3	53·0	54·1	43·4	45·1	81·1	87·0	88·8	85·0	—
75·0	107·6	5·7	58·4	71·1	49·9	58·1	52·5	27·5	81·2	87·7	91·9	81·1	80·2
77·0	110·6	8·1	64·5	77·8	46·8	49·2	38·4	—	86·1	91·0	96·1	86·5	73·3
—	—	—	—	65·8	55·0	58·4	38·5	47·2	77·3	82·5	84·8	73·9	80·1
73·9	105·8	4·3	60·8	75 5	52·4	57·3	35·1	22·5	77·1	81·5	83·4	82·0	79·8
77·8	98·5	−1·2	61·8	71·9	49·6	52·9	41·5	43·6	78·4	83·7	87·3	82·0	79·0
80·6	96·1	−3·1	68·9	67·9	50·9	54·0	39·5	32·4	86·1	91·7	93·0	85·2	78·5
78·8	99·6	−0·3	65·7	67·4	54·4	59·1	34·8	—	77·3	83·3	87·2	75·6	84·9
77·7	97·1	−2·2	61·6	69·0	51·8	54·0	27·6	33·3	77·6	79·7	82·5	76·9	85·0
76·7	98·6	−1·1	63·5	70·1	52·1	53·5	42·3	43·3	77·9	82·6	83·8	82·5	77·7
78·1	100·7	0·6	61·1	66·8	50·9	51·7	32·9	12·3	82·1	87·4	91·0	83·3	89·4
76·9	103·3	2·6	61·8	64·8	51·3	54·8	28·8	21·0	73·8	78·7	83·3	74·8	81·1
75·3	104·2	3·1	60·0	69·3	54·3	58·7	37·3	34·1	80·5	86·8	89·7	79·3	73·9
—	—	—	—	60·9	50·9	51·0	37·9	—	85·8	—	—	81·0	—
—	—	—	—	—	—	56·0	—	24·8	80·5	—	—	78·5	—
75·0	103·7	2·7	63·0	70·1	47·6	49·2	35·9	29·4	82·8	86·4	—	82·2	94·6
81·0	106·0	4·8	62·2	—	52·4	56·3	41·3	38·2	81·7	87·6	89·5	79·5	—
—	—	—	—	72·1	47·2	51·9	44·4	27·3	76·7	82·5	82·5	76·7	78·1
74·6	95·7	−3·2	56·0	68·3	51·1	54·1	29·1	27·1	78·0	82·5	86·2	79·6	—
76·9	99·2	−0·6	59·2	67·3	51·5	51·6	38·4	20·9	78·9	83·3	87·8	81·9	85·2
70·3	106·6	4·7	57·1	62·7	57·9	58·6	34·8	25·7	81·6	87·6	90·0	82·0	75·7
75·1	94·6	−4·0	60·5	79·1	45·4	—	59·3	30·0	84·7	88·7	90·6	85·4	—
79·1	102·2	1·7	66·9	74·2	44·4	46·3	—	31·5	83·7	—	—	—	90·7
78·6	97·9	−1·6	64·5	—	—	—	33·9	23·8	71·7	78·2	79·5	76·5	—
73·9	98·9	−0·8	60·2	—	54·5	62·5	29·6	9·5	71·9	78·7	82·7	75·3	—
84·0	95·4	−3·9	70·4	78·9	44·4	45·7	45·0	30·5	85·7	93·4	93·4	87·0	79·2
—	—	—	—	68·7	50·7	56·3	35·3	23·5	80·0	87·9	90·0	82·5	—
78·1	104·5	3·5	67·3	64·3	53·0	59·3	42·7	35·4	74·1	77·3	82·1	75·3	88·6
79·2	97·8	−1·7	60·7	66·8	48·9	52·0	47·4	34·4	75·6	81·8	86·2	73·4	79·0
81·8	102·2	1·8	65·1	64·1	52·3	52·5	42·8	31·0	76·5	84·7	88·8	79·3	84·6
74·4	111·2	8·3	64·1	65·0	53·0	53·7	45·4	27·8	86·0	93·3	93·3	83·2	87·8
78·7	104·9	3·9	62·6	69·0	50·5	51·7	44·0	25·0	84·6	90·3	90·3	86·5	78·5
75·0	110·2	7·6	61·4	57·1	52·4	53·8	39·5	15·1	83·2	87·1	90·7	84·1	86·3
77·8	100·7	0·6	57·5	62·9	51·0	55·5	43·7	—	78·6	84·1	—	80·4	83·5
—	105·3	—	—	68·9	52·9	54·6	50·9	20·2	80·7	86·9	89·9	80·4	69·8
75·3	104·2	3·2	—	67·1	47·5	50·5	49·8	34·4	87·5	94·6	94·6	89·0	76·3
80·5	101·8	1·4	60·5	62·1	53·0	55·3	38·8	29·4	83·7	95·9	—	88·8	—
76·4	102·3	1·8	61·0	67·3	47·6	46·1	47·7	24·8	83·2	90·4	—	77·9	80·6
77·8	104·6	3·6	62·1	77·4	43·6	46·6	41·3	41·2	84·2	89·4	—	88·7	69·8
75·9	106·3	4·8	62·7	69·0	53·0	53·9	40·4	18·3	81·0	89·9	90·9	79·8	79·4
76·4	107·9	6·1	60·5	63·3	56·4	56·4	—	37·0	85·3	—	—	83·0	79·5
77·6	102·3	1·8	61·7	63·7	53·7	54·5	—	16·5	75·9	—	—	78·0	82·2
75·5	109·0	6·8	64·7	62·6	54·0	55·9	32·5	23·2	71·4	80·2	80·2	79·0	—
84·2	100·4	0·3	66·1	68·0	48·0	52·8	50·0	31·1	84·6	91·6	92·1	86·8	—
77·3	107·2	5·5	64·2	64·0	47·1	50·5	46·1	34·9	89·8	100·6	100·6	88·9	91·8
77·8	106·3	4·9	63·8	69·8	47·7	49·2	41·3	31·1	84·3	93·2	94·4	85·0	91·2
75·4	105·5	4·2	62·3	63·9	51·9	54·0	44·6	—	83·8	91·1	93·6	85·2	81·9
78·0	100·4	0·3	67·5	70·6	—	—	39·8	16·7	89·7	98·7	—	89·4	—
78·6	101·5	1·1	60·5	67·4	52·4	53·3	39·1	29·0	77·4	81·4	—	80·6	74·8
78·9	101·6	1·2	—	—	—	46·9	—	—	—	—	—	—	—
77·1	106·3	4·8	—	—	—	46·8	—	—	—	—	—	—	—
77·1	107·1	5·5	—	—	—	46·9	—	—	—	—	—	—	—
77·5	107·3	5·6	—	—	—	41·1	—	—	—	—	—	—	—
82·4	105·6	4·6	68·7	61·2	53·4	53·5	43·0	20·3	78·9	85·5	—	80·0	81·8
75·8	115·6	11·8	62·4	71·3	52·2	52·3	40·2	19·1	78·3	84·3	86·3	78·7	76·2
78·3	103·6	2·8	65·4	64·7	44·8	44·8	—	29·0	85·0	—	91·4	84·4	75·3
79·4	103·9	3·1	70·9	68·9	50·2	53·1	44·1	30·8	84·6	89·4	89·4	82·5	73·9
79·4	105·2	4·1	66·9	61·4	51·2	50·6	57·9	16·7	88·1	95·4	95·4	81·1	78·0
77·1	108·7	6·7	68·2	64·2	57·9	57·9	40·3	27·5	79·5	87·4	—	84·9	80·2
79·1	106·7	5·3	65·3	62·9	53·2	52·1	33·9	21·0	83·8	90·8	—	83·6	83·7
75·2	108·0	6·0	66·7	69·4	52·9	51·3	47·9	23·1	81·3	87·6	87·6	82·5	73·8
—	—	—	—	65·1	50·0	51·3	41·4	28·6	80·8	87·1	—	78·2	—
80·9	105·8	4·7	65·3	68·1	54·1	55·3	41·3	20·8	79·9	82·8	82·8	77·6	—
77·9	100·0	0·0	60·1	—	51·7	54·6	—	—	86·1	94·5	94·5	84·0	87·1
71·9	110·4	7·5	60·4	—	54·7	55·6	—	—	80·5	87·6	—	82·9	—
74·5	107·3	7·1	61·0	—	53·0	53·0	—	—	77·8	84·2	84·2	80·0	83·0
78·7	105·3	4·2	—	—	—	56·1	—	—	—	—	—	—	—
79·5	98·8	−1·0	—	—	—	52·6	—	—	—	—	—	—	—
75·8	109·2	7·0	—	—	—	52·4	—	—	—	—	—	—	—
78·0	107·0	5·4	—	—	—	51·1	—	—	—	—	—	—	—

84·3	—	—	—	—	—	—	—	Atak, natus Soengi Coembo? e gente Banjermasin, Swaving-Z., Batavia
80·7	72·6	77·8	84·3	39°·8	67°·1	73°·1	29·1	Amio? natus Korin, Banjermasin, Borneo, Swaving, Batavia, 29. vi. '60
80·8	75·5	83·5	95·6	36°·1	70°·1	73°·8	28·6	Hadjie Moetamat, e gente Banjermasin, Borneo, natus Pengaran, Swavi
77·4	80·9	91·6	83·9	42°·3	69°·5	68°·2	35·9	Hadjie Heman, e gente Banjermasin, natus Pengaran (Borneo), Swavin
81·7	—	—	82·4	—	—	—	—	Manon, e gente Banjermasin, natus Soengi Loembo (Borneo), Swaving-Z
81·5	88·5	95·6	84·7	42°·5	65°·8	71°·8	24·1	Penkeng Bapa Poeya, e gente Banjermasin, natus Poeloe Petak, Batavi
76·6	85·8	89·6	93·4	38°·2	79°·0	62°·8	31·1	Talhah, natus Amonthey Banjermasin, incola Palembangan, Borneo, Sw
81·4	—	—	82·9	41°·2	79°·2	59°·6	—	Faloedin piscator, natus Kampong Amboela prope Banjermasin, Swavin
91·6	—	—	82·1	—	—	—	—	Karnim, e gente Banjermasin, natus Pengaran (Borneo), Swaving-Z., B
70·5	—	—	90·0	—	—	—	—	Dajak Inol, incola Moeweng (Banjermasin), Kapala Lampong, Swaving
86·6	78·2	85·5	76·1	36°·4	73°·8	69°·8	25·9	Aroem, natus Soengi Katjiel, e gente Banjermasin (Borneo), Swaving-Z
85·0	—	—	82·7	44°·5	69°·8	65°·7	—	Oetal, natus Mortangoera, e gente Banjermasin, Batavia, 5. iv. '60, Swa
81·1	80·2	83·7	83·8	42°·9	66°·3	70°·8	34·4	Moehamat Salet, e gente Banjermasin, natus Martapoera (Borneo), Swa
86·5	73·3	78·9	78·8	47°·5	68°·6	63°·9	43·5	Chef Kanapie de Bejadjoe Sajaks, rivière Kahajak (Borneo), Swaving-Z
73·9	80·1	89·3	—	—	—	—	33·1	Dajak van Sandak (Borneo). Gezonden door Dr Vorstmann, Officier va
82·0	79·8	86·9	94·4	43°·5	66°·6	69°·9	30·7	Pintjen, Dajak Kajan (W.-A. Borneo), man 45 jaar.
82·0	79·0	93·4	77·6	44°·0	72°·7	63°·3	30·8	Igil Dajak, Ketoengan (W.-A. Borneo), man 35 jaar.
85·2	78·5	84·8	89·1	41°·3	80°·9	57°·8	30·7	Sibi, Dajakshoofd, Moealang (W.-A. Borneo), man 50 jaar.
75·6	84·9	93·2	80·4	37°·5	81°·6	60°·9	26·3	Tingga Dajak, Moealang W. Borneo, man 35 jaar.
76·9	85·0	92·6	75·1	39°·0	74°·0	67°·0	36·5	Parang Dajak, Moealang W. Borneo, man 25 jaar.
82·5	77·7	84·4	83·8	40°·6	70°·4	69°·0	24·8	Aloek Dajak, Kabakan W. Borneo, man van 25 jaar.
83·3	89·4	96·0	78·7	45°·0	69°·9	65°·1	25·2	Borneo, misit Dr Heppener, 1808.
74·8	81·1	92·0	84·8	43°·3	72°·6	64°·1	35·0	Borneo, Schwaner, 1846.
79·3	73·9	78·3	92·7	41°·4	67°·6	71°·0	35·8	Borneo, Schwaner.
81·0	—	—	—	—	—	—	—	Borneo, Schwaner.
78·5	—	—	—	—	—	—	—	Demang Lehman, Borneo Malapoera. Geexecuteerd 27. ii. '64 door v. d
82·2	94·6	100·9	81·8	45°·6	72°·1	62°·3	29·0	Djalil, Borneo. Geschenk van v. d. Bossche, Gouverneur van Sumatra'
79·5	—	—	82·1	—	—	—	—	Mangon Yoeda, alias Kassim, Borneo. Geschenk van v. d. Bossche, Go
76·7	78·1	85·2	—	—	—	—	29·5	Dajak, Borneo, Diard.
79·6	—	—	80·4	42°·1	73°·2	64°·7	—	Dajak, Borneo, Schwaner.
81·9	85·2	93·2	78·8	43°·4	73°·5	63°·1	32·0	Djan, maniacus dicitur Dajak anthropophagus, Batavia, 18. i. ?, Swavi
82·0	75·7	82·8	96·3	38°·2	68°·4	73°·4	30·8	—— (Ohne Aufschrift).
85·4	—	—	90·1	45°·2	65°·7	69°·1	28·9	Dajak, stam der Batang-Loepers, West-Kust Borneo. Geschenk van D
—	90·7	98·8	—	45°·7	76°·9	57°·4	31·2	Dajak, stam der Batang-Loepers. Geschenk van Dr Daniels, Officier va
76·5	—	—	82·8	—	—	—	—	Dajak, van Sambas, Kapala Kampong. Geschenk van Dr Mohneke, Sw
75·3	—	—	71·8	—	—	—	—	Boesgoe, natus Pontianak, Borneo. Swaving-Z., Batavia, 27. ii. '69.
87·0	79·2	88·4	82·2	46°·6	69°·2	64°·2	35·5	Incola Mahabahan, e gente Dajak. Geschenk van den Heer Edeling, St
82·5	—	—	—	—	—	—	—	Dajak van Amonthey. Gezonden door den Heer W. de Wall, Swaving-
75·3	88·6	98·5	79·6	40°·6	74°·5	64°·9	24·8	Apoey Dajak, Bedadjoe (Banjermasin), Swaving-Z., Batavia, 1862.
73·4	79·0	89·0	74·0	40°·5	76°·5	63°·0	26·6	
79·3	84·6	93·1	75·8	38°·2	77°·1	64°·7	—	
83·2	87·8	92·6	82·8	39°·9	70°·8	69°·3	—	
86·5	78·5	81·8	83·1	42°·3	65°·4	72°·3	31·0	
84·1	86·3	91·2	81·1	34°·3	79°·8	65°·9	22·5	
80·4	83·5	39·7	74·6	37°·3	76°·4	66°·3	31·8	
80·4	69·8	77·2	83·8	39°·3	71°·6	69°·1	25·8	
89·0	76·3	82·6	85·4	41°·4	65°·3	73°·3	35·9	
88·8	—	—	78·9	38°·9	76°·5	64°·6	—	
77·9	80·6	84·5	78·3	40°·2	71°·0	68°·8	33·9	
88·7	69·8	75·3	79·7	44°·3	65°·6	70°·1	39·1	
79·8	79·4	87·0	86·7	41°·4	71°·6	67°·0	29·4	
83·0	79·5	86·0	86·6	37°·7	71°·4	70°·9	29·5	
78·0	82·2	89·1	85·5	39°·0	74°·2	66°·8	28·3	
79·0	—	—	83·9	36°·4	72°·9	70°·7	—	
86·8	—	—	83·0	38°·2	74°·6	67°·2	—	
88·9	91·8	98·0	92·5	40°·8	76°·3	62°·9	31·0	
85·0	91·2	98·9	78·9	43°·7	75°·1	61°·2	26·0	
85·2	81·9	87·7	—	39°·1	70°·2	70°·7	26·0	
89·4	—	—	82·6	41°·3	75°·4	63°·3	—	
80·6	74·8	81·8	84·1	39°·5	71°·9	68°·6	—	
—	—	—	—	36°·6	70°·0	73°·4	—	
—	—	—	—	37°·8	67°·5	74°·6	—	
—	—	—	—	38°·0	76°·8	65°·2	—	
—	—	—	—	36°·4	71°·8	71°·8	—	
80·0	81·8	88·6	87·1	39°·1	70°·6	70°·3	22·3	
78·7	76·2	85·4	77·9	41°·2	68°·4	70°·4	26·0	
84·4	75·3	81·3	75·7	37°·0	77°·7	65°·3	18·2	
82·5	73·9	78·8	85·8	38°·1	73°·9	68°·0	36·0	
81·1	78·0	80·3	91·4	38°·7	69°·0	72°·3	17·1	
84·9	80·2	85·7	87·0	38°·6	68°·1	73°·3	24·9	
83·6	83·7	91·6	88·7	37°·1	75°·1	67°·8	20·3	
82·5	73·8	79·6	81·2	41°·8	68°·2	70°·0	26·5	
78·2	—	—	87·0	36°·0	78°·0	66°·0	—	
77·6	—	—	88·0	39°·5	69°·9	70°·6	—	
84·0	87·1	91·5	87·3	38°·4	74°·9	66°·7	—	
82·9	—	—	88·7	—	—	—	—	
80·0	83·0	89·0	88·1	38°·1	71°·0	70°·9	—	
—	—	—	—	38°·2	70°·9	70°·9	—	
—	—	—	—	32°·8	89°·3	57°·9	—	
—	—	—	—	36°·9	65°·3	77°·8	—	
—	—	—	—	39°·0	70°·5	70°·5	—	

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atavia, 29. vi. '60.
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oe Petak, Batavia, 3. i. '61.
ngan, Borneo, Swaving-Z., Batavia, 21. ii. '62.
jermasin, Swaving-Z., Batavia, 9. iii. '62.
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e Wall, Swaving-Z., Batavia, 17. xii. '61.
atavia, 1862.

	Nr.	*L*	*F*	*B*	*H′*	*H*	*OH*	*LB*	*B′*	*U*	*Gl.U*	*Q′*	*βQ′*
MITTEL JAVA	121	155	154·5	137	131·5	133	106·5	96·0	91·4	464	468	295	291·5
	126	169	169	139·5	137·5	139	117·5	99·2	89·5	486	491	319	319
	128	176·5	176	141·5	139	140·5	116	103·0	92·1	507	512	329	323
	133	181	181	146·5	142·5	142	120	105·7	98·0	526	529	328	328·5
	136	165	164·5	140·5	123	125	110·5	94·1	90·0	483	486	312	312
	137	175	172	137	131	132	109·5	99·0	93·6	498	500	299	300·5
	122	174·5	174	144	131·5	132·5	109	101·6	97·8	502	505	310	310
	123	179	178	141·5	143·5	143·5	119	99·6	99·0	508?	511?	324	323
	124	166	166	141·5	138·5	139	114	94·0	92·0	488	490	317	318
	127	177	175	141	136·5	138	112	97·0	84·0	502	503	310	304
	131	178·5	177·5	138	131	132	112	101·0	94·0	504	508	306	308
	132	176·5	177·5	149	134	135	119	90·0	95·0	510	505	333	328
	134	173	173	149	137	139·5	117·5	100·0	97·8	507	514	331	327
	135	182	180·5	143	143	145	121	100·0	96·2	516	519	330	326
	139	173·5	170·5	130·5	139	142	110	104·2	82·8	485	491	299	296
	142	161	160·5	139	129·5	132	112	92·0	86·8	473	473	308	309
	145	164	163·5	140	134	135·5	108	100·0	82·2	472	481	310	306
	141	169·5	169	140	135	137	117	98·2	92·7	499	502	309	316
	151	173	173	141	132	131	110	99·3	82·6	492	496	305	306
	152	162·5	162·5	149	132	134	118·5	93·7	95·5	493	496	331	330
	153	163	163	141·5	132·5	134	113	100·9	102·1	497	499	320	320
	154	173	173	145	130	131	113	95·0	90·5	512	514	320	318
	155	163	162	145·5	135·5	138·5	113·5	98·0	89·4	488	492	315	313·5
	147	169·5	167	142	125·5	128	109·5	93·0	85·8	495	501	314	312·5
	148	187	184	151	144	145	121	99·9	96·2	540	543	337	336
	149	191·5	191	135·5	146	146	123·5	109·9	90·9	527	532	329	326
	150	168	168	140·5	133	133	111	100·3	98·0	490	494	317	315
	157	179·5	176	141·5	138·5	139·5	119·5	102·3	90·6	511	513	328	323
	158	173	173	143	133	133·5	112·5	97·1	97·0	501	504	313	309
	160	179·5	178	152	133·5	137	118	102·0	95·0	527	528	335	330
OST JAVA	156	184	184	139·5	140	142	117·5	96·1	91·8	510	513	—	323
	163	172	171	149	144	145·5	119	97·0	90·8	497	497	—	332·5
	164	189	184·5	141·5	133	136	114·5	105·9	99·3	527	531	—	315
	166	173	172	137	134	135	113·5	95·0	91·2	492	497	—	310·5
	165	169	169	136·5	129	131	114	102·1	96·0	484	489	—	301·5
	167	163	163	137	134	136	112	98·2	93·8	473	476	—	306
VARIA	1	170	170·5	130·5	135	133	118·5	93·8	100·2	492	495	—	313
	2	200	199	163	158	162	138	113·6	99·7	567	565	—	368
	4	180·5	178	146·5	139·5	139·5	115	103·3	94·0	514	520	—	323
	5	169·5	166	140·5	136	135·5	115·5	97·0	91·5	494	496	—	311
	6	171·5	168	142	—	—	—	104·0	98·3	495	501	—	321
	7	171	170	143	137	139	114	92·0	92·8	497	499	—	318
	8	177	174	144	130·5	133	110	97·4	87·5	508	510	—	306
	9	157	157	146	133	133	112	92·4	104·0	480	484	—	318
	10	167	166	135	—	—	—	97·2	89·0	483	486	—	316
	11	186	184·5	141	134	136·5	116	102·6	92·4	514	520	—	319
	12	185	185	136	142	142	117	105·5	93·0	504	507	—	317
	13	173	172	150·5	133	135·5	115	101·2	96·2	506	511	—	320
	14	181	179·5	141·5	129	128	115	98·4	92·0	509	512	—	319
	15	173	172	139	140	140·5	118	102·0	92·7	498	498	—	318
	16	182	180	139	135·5	138	117	101·0	90·3	504	507	—	318
	18	183	182·5	136·5	139·5	140·5	115	102·3	98·7	514	513	—	309
	21	170·5	170	151	139	140·5	118	97·5	95·0	510	508	—	331
	24	163	162·5	141	139·5	139	114	97·3	94·5	494	490?	—	322
	25	172	170	143	140	141·5	117	107·0	89·6	499	502	—	323
	26	168	166·5	138	134	136	114	97·3	87·8	492	493	—	308
	82	159	156	134	114	115	102	95·2	91·1	462	470	—	284
	119	174	173	147	136	137·5	116	98·6	93·4	506	508	—	322
	138	173	171·5	147	—	—	—	100·5	90·5	508	512	—	315
	140	172	171·5	146	135	135	122	100·2	99·0	510	514	—	328
	146	166·5	163·5	145·5	130·5	130	111	98·2	94·8	487	489	—	316
	168	194	193	141	134·5	134·5	113	103·9	96·6	525?	525?	—	314
	170	184	185	145	138	141·5	118	104·0	93·1	519?	524?	—	323
	171	163	161·5	142	138	140·5	116	91·7	91·3	486	489	—	317
	224	176	175	140·5	133·5	135	112·5	100·3	98·2	502	503	—	307

Q'	$\beta Q'$	S_1'	S_2'	S_3'	S_1	S_2	S_3	S	*fml*	*fmb*	$G'H$	J	GB	GL	PH	NHR	N
295	291·5	99·9	94·9	93·4	110	106	104	322	33·6	31·8	66·2	129	95·3	88·1	16·0	51·0	5
319	319	108·1	106·5	94·0	121	124·5	110	355·5	34·0	26·0	74·5	135	98·5	101·2	19·3	57·0	5
329	323	106·0	115·0	96·0	123	134	109	366	35·8	31·0	67·5	137	97·8	98·0	17·0	50·9	5
328	328·5	120·8	106·2	97·0	137	118·5	114·5	370	37·0	29·2	76·9	138·5	108·0	101·1	18·2	60·5	6
312	312	101·2	102·7	89·0	115·5	116·5	100	332	34·2	27·4	65·9	127	98·2	94·0	18·0	51·2	5
299	300·5	108·0	109·2	92·7	124	122	106	352	36·2	32·0	62·5	133	101·3	100·0	13·0	48·5	5
310	310	110·0	99·5	99·0	128	110	115	353	33·5	29·0	73·1	—	96·2	96·3	21·0	55·0	5
324	323	116·0	120·5	91·4	133	138	104	375	41·0	33·0	70·0	136	108·0	95·5	16·2	54·0	5
317	318	114·2	106·2	90·8	135	124	101	360	33·9	29·0	67·8	140	96·0	85·5	20·0	47·9	4
310	304	111·3	107·2	101·1	127·5	119·5	118	365	35·2	30·1	68·0	127	94·8	87·9	13·0	53·9	5
306	308	103·0	104·6	98·0	115	127	117	359	35·5	30·0	69·0	132	102·0	98·4	18·0	49·2	4
333	328	111·1	111·2	101·6	131	124	122	377	32·3	26·7	66·4	135	93·0	92·1	16·9	48·7	4
331	327	107·5	111·2	93·0	129	131	105	365	34·1	30·0	68·2	128	95·8	95·8	15·5	51·5	5
330	326	117·0	116·2	99·0	130	131	116	377	37·5	31·0	73·0	138	107·0	99·6	22·0	53·8	5
299	296	102·4	108·8	99·0	116·5	125·5	116	358	37·7	31·0	73·2	134	95·0	105·0	22·0	51·9	5
308	309	106·0	100·6	87·0	122	115·5	98	335	36·1	28·0	69·5	125·5	105·5	97·0	18·9	50·7	5
310	306	103·7	97·3	95·4	116	108	111	334	33·4	30·2	68·3	136	95·0	100·2	21·0	49·7	4
309	316	108·6	114·6	92·1	124	133·5	106·5	364	32·9	29·0	71·1	132	105·3	102·0	19·5	52·9	5
305	306	106·0	108·6	92·2	119	124	108·5	351·5	37·0	29·2	72·6	138·5	97·5	98·6	22·0	52·6	5
331	330	101·1	107·0	93·0	116	124·5	105	345	35·8	32·0	61·9	129	93·0	91·5	14·3	48·0	4
320	320	103·7	106·1	88·5	115·5	122	98·5	337	34·6	26·3	73·0	135·5	102·6	92·2	22·1	54·0	5
320	318	109·0	111·0	98·3	127	125	116	368	35·0	30·2	72·0	136·5	99·8	96·0	23·4	51·0	5
315	313·5	107·9	107·5	92·0	120	126	101	347	34·8	29·5	69·8	138	98·0	97·0	16·9	52·8	5
314	312·5	105·6	100·2	98·3	118	114	116	348	34·9	27·8	66·9	137	102·3	92·1	14·3	52·2	5
337	336	118·2	116·6	102·7	134	130·5	122	388	39·0	32·6	81·4	144	102·2	94·1	24·1	59·2	5
329	326	115·6	118·1	103·7	130	127·5	120	379	42·1	30·3	72·5	139·5	106·2	101·6	17·0	56·1	5
317	315	105·0	108·0	90·0	121	122	104	347	32·6	27·2	70·0	136·5	110·2	105·0	18·5	51·0	5
328	323	114·0	114·1	96·1	130	129	108	367	38·1	28·8	73·8	139·5	109·2	103·3	21·0	53·9	5
313	309	106·0	109·2	97·0	120	124	115	359	31·5	25·5	75·0	136·5	103·8	100·0	20·5	53·0	5
335	330	108·0	113·1	102·9	121	126·5	116	363	36·1	29·6	80·9	139·5	103·1	105·3	24·8	55·7	5
—	323	115·0	122·0	100·0	133	137·5	116	386	33·6	28·1	71·0	131	96·0	89·4	19·8	52·1	5
—	332·5	119·0	110·8	100·5	137	130	110	377	39·0	30·0	76·4	132	100·0	92·2	23·2	53·3	5
—	315	115·7	112·0	97·8	130	125	114·5	369·5	35·6	30·3	83·7	134	102·8	111·5	25·5	62·8	6
—	310·5	111·0	115·6	93·0	124	130·5	104	358·5	34·8	29·6	73·7	128·5	94·3	93·8	22·7	51·0	5
—	301·5	101·1	104·2	93·3	112·5	117·5	106·5	336·5	36·0	33·0	72·1	133	104·0	100·4	20·1	51·3	5
—	306	104·3	104·3	90·4	116	118·5	102	337	36·6	31·2	65·5	134	99·1	95·0	15·4	48·9	4
—	313	114·1	115·0?	96·0?	133	133?	106·5?	372·5	34·9	31·0	67·0	137	104·6	94·2	19·0	48·3	4
—	368	130·0	126·0	114·0	150	144	132	426	37·0	31·0	73·0	142	107·2	106·4	20·0	53·1	5
—	323	117·6	104·6	107·0	134	115	124	373	34·0	27·0	74·4	137	99·0	95·0	23·5	51·5	5
—	311	108·6	106·3?	102·4	122	116?	116	354	32·5	29·0	61·0	140	103·0	100·0	14·7	47·0	4
—	321	111·1	107·0	89·0	123	122	103	348	35·0	30·0	73·0	139	104·0	106·5	21·9	52·0	5
—	318	106·3	109·2	100·0	123	124	116·5	362·5	34·2	28·0	74·6	135·5	97·4	88·4	20·8	52·5	5
—	306	109·0	108·1	99·4	125·5	127·5	116·5	368	33·6	29·0	65·2	131	102·8	93·2	18·9	48·5	4
—	318	107·0	98·0	90·0	123·5	109·5	101	334	34·3	28·3	68·5	133	103·0	89·3	19·5	49·0	4
—	316	115·4	107·0	90·0	130	126	102	358	39·8	29·5	70·2	129·5	99·8	97·2	21·4	50·4	5
—	319	118·8	116·8	96·0	137	130	117	385	33·1	29·0	69·0	137	102·8	99·2	12·8	57·2	5
—	317	114·3	124·0	98·7	130·5	139·5	111	382	33·0	30·1	72·9	130·5	96·1	106·6	23·3	50·0	5
—	320	111·2	106·0	93·0	123	119	110	352	34·0	29·0	70·3	137	113·6	90·0	18·0	55·5	5
—	319	112·8	101·0	101·2	130·5	109	125·5	365	33·5	26·5	70·0	136	101·2	104·2	17·0	51·0	5
—	318	117·0	104·0	103·2	132	116·5	116	364·5	37·2	30·0	67·8	133	105·0	97·8	16·0	52·0	5
—	318	110·0	111·7	103·0	124	127	124	375	34·9	28·9	70·5	137	108·6	104·0	17·9	53·0	5
—	309	117·0	114·2	93·5	135·5	128	111	374·5	35·8	30·0	66·7	133	101·5	100·0	18·0	53·1	5
—	331	110·3	114·0	97·3	127	132	109	370	33·4	29·7	68·0	134	102·3	97·8	14·7	56·0	5
—	322	109·7	100·0	95·6	125	112·5	109	347·5	36·1	31·5	73·1	131·5	102·5	96·5	21·7	52·7	5
—	323	111·3	111·9	85·0	124	134	98	356	35·5	34·0	78·0	144	108·0	99·2	24·0	55·3	5
—	308	105·0	106·2	97·0	120	120	112	352	34·8	29·0	69·0	131	104·0	100·5	22·2	49·0	4
—	284	102·0	96·2	88·0	112	109·5	106	329	26·8	23·0	66·4	125	103·0	101·8	20·5	48·7	4
—	322	112·3	108·0	107·0	125	120	123	368	35·0	28·0	67·0	133	96·2	94·0	18·4	49·1	4
—	315	112·2	107·6	102·3	122·5	123	114	361	39·2	32·2	79·1	143	103·2	92·1	22·3	62·3	6
—	328	108·5	105·7	108·0	123	116·5	122	361·5	35·5	30·4	70·5	131	94·2	103·0	16·0	55·5	5
—	316	109·2	101·0	92·0	122	116	101	339	39·5	33·8	70·0	135	98·0	94·0	19·7	52·2	5
—	314	118·0	118·0	93·0	131·5	130·5	118·5	380·5	37·7	27·8	88·2	138	104·5	106·0	24·3	62·5	6
—	323	110·8	114·0	104·0	126·5	131·5	119	377	37·1	31·4	71·4	136·5	102·3	98·1	15·6	55·8	5
—	317	108·0	111·0	93·8	122	133	102·5	357·5	38·0	31·2	64·0	135	93·0	89·0	16·0	49·0	4
—	307	104·7	105·0	97·3	122	116	116	354	36·7	30·8	68·6	137·5	96·4	97·2	16·0	53·0	5

PH	NHR	NHL	NH′	NB	SC	SS	DC	DS	DA	O_1R	$O_1'R$	Lacr. O_1R	O_2R	O_1L	$O_1'L$	Lacr. O_1L	O_2L	G_1	G_1'	G_2	EH	F
16·0	51·0	51·0	48·3	23·2	6·5	1·9	21·2	8·2	28·0	42·7	37·5	37·5	37·8	41·0	37·9	37·1	38·0	42·0	39·1	39·0	12·8	8
19·3	57·0	56·1	54·2	27·7	12·3	5·4	23·8	9·1	30·0	42·7	38·5	38·5	33·3	41·0	37·4	36·2	33·9	53·9	48·6	42·0	13·0	8
17·0	50·9	51·9	49·6	26·0	14·0	5·1	23·0	9·0	31·0	41·0	—	37·9	33·8	41·4	—	37·8	34·5	47·5	43·9	43·8	11·8	8
18·2	60·5	62·2	56·9	30·9	7·6	2·8	22·1	8·9	29·5	46·4	43·0	41·3	35·2	45·0	42·0	40·1	35·1	55·0	51·5	43·1	15·0	8
18·0	51·2	50·8	46·5	23·0	8·2	3·1	21·8	8·9	29·5	44·9	39·3	39·3	34·0	42·9	38·2	38·2	33·2	48·0	43·0	38·0	12·9	8
13·0	48·5	50·0	48·0	31·9	8·5	2·9	22·0	9·0	29·0	45·2	39·9	39·9	32·5	42·0	37·2	37·2	32·8	51·8	48·0	39·6	9·8	8
21·0	55·0	54·1	51·7	28·0	10·5	2·4	23·0	6·3	28·0	45·0	40·3	40·3	36·5	41·5	37·8	37·8	35·3	48·0	45·8	36·5	11·7	8
16·2	54·0	53·8	52·0	26·6	10·6	3·0	—	—	—	46·0	—	—	35·3	44·0	—	—	36·0	46·8	42·3	38·8	10·0	8
20·0	47·9	48·8	46·5	24·6	8·2	1·5	22·2	8·0	29·0	40·2	35·8	35·8	32·3	41·0	34·9	34·9	31·2	46·0	42·2	36·0	11·8	8
13·0	53·9	53·0	53·0	24·0	9·0	3·5	20·8	11·0	32·0	41·0	37·8	37·8	36·1	41·0	37·3	37·3	36·0	43·7	40·2	38·2	8·8	8
18·0	49·2	49·2	49·0	26·0	13·5	3·2	—	—	—	45·1	40·7	40·7	33·4	43·8	—	—	33·6	50·2	47·0	38·6	14·7	8
16·9	48·7	49·0	48·0	24·1	6·0	1·8	23·0	6·0	28·0	40·5	—	37·0	32·4	39·0	—	36·0	32·3	49·0	46·9	38·0	10·2	8
15·5	51·5	52·4	51·8	25·6	5·8	1·0	22·4	7·8	28·0	43·3	39·0	38·0	36·2	43·0	38·7	38·0	36·2	49·0	45·5	43·2	12·0	8
22·0	53·8	54·5	50·0	28·9	6·5	3·0	24·8	10·4	33·0	43·0	39·5	39·0	34·1	41·0	38·5	37·2	35·0	47·9	45·8	38·5	7·0	8
22·0	51·9	50·0	49·3	29·8	8·0	3·6	20·0	8·8	26·5	42·5	38·0	38·0	34·1	41·4	39·1	37·1	33·4	51·3	47·0	42·9	11·6	8
18·9	50·7	50·9	49·0	28·0	4·3	—	21·6	8·4	28·0	41·1	38·0	38·0	34·0	40·5	37·3	36·9	33·8	50·6	46·6	—	—	8
21·0	49·7	49·1	46·8	25·2	6·8	2·0	20·9	7·9	29·0	41·6	38·0	37·1	30·5	41·0	37·0	36·0	30·5	52·0	49·1	41·0	11·5	8
19·5	52·9	52·9	50·2	27·0	10·3	3·0	25·5	10·0	33·0	43·6	—	38·2	33·0	41·0	—	37·0	33·8	54·2	48·3	43·5	11·8	8
22·0	52·6	52·2	50·5	26·2	6·0	3·0	19·6	8·0	26·5	40·2	40·2	38·1	33·1	42·5	39·3	38·0	33·3	50·8	46·2	38·5	12·3	8
14·3	48·0	48·0	46·8	26·0	9·5	4·0	22·0	7·1	28·5	40·2	—	—	31·8	40·2	—	—	30·8	46·2	42·0	—	—	8
22·1	54·0	53·8	48·9	24·8	11·6	4·7	26·0	11·0	34·0	45·0	40·0	40·0	36·6	43·4	39·1	38·0	36·1	46·5	43·0	40·9	11·2	8
23·4	51·0	51·0	49·5	28·0	7·0	2·1	21·3	8·0	29·0	41·5	37·6	37·6	33·0	40·0	36·4	36·4	33·0	51·0	47·8	40·0	13·7	8
16·9	52·8	53·0	52·9	27·0	8·2	3·4	—	—	—	46·1	—	—	34·0	43·6	—	—	32·9	48·3	46·1	42·0	11·8	8
14·3	52·2	51·0	50·8	27·0	4·0	—	19·3	8·5	28·0	42·5	38·4	38·4	33·7	41·1	—	—	33·4	49·6	43·9	37·8	8·0	8
24·1	59·2	59·2	56·1	27·0	9·7	3·3	25·3	8·8	30·0	41·9	39·6	37·9	37·3	40·9	36·9	36·9	38·0	47·7	42·6	40·8	16·3	8
17·0	56·1	55·3	55·0	26·9	10·5	5·9	22·5	12·0	35·0	41·9	38·8	38·2	32·5	42·3	39·2	37·5	32·9	53·5	50·0	40·7	15·0	8
18·5	51·0	51·5	51·5	29·0	3·0	—	28·0	7·1	33·0	46·0	40·0	40·0	35·0	46·8	—	—	34·0	55·9	50·0	40·6	9·8	7
21·0	53·9	53·0	50·7	27·9	11·4	3·0	22·5	8·9	29·5	43·9	39·8	39·0	32·9	41·8	38·9	38·0	33·8	53·1	47·2	43·8	13·2	8
20·5	53·0	53·3	52·9	27·3	10·0	3·1	24·3	9·3	32·0	43·1	39·6	—	33·9	42·1	38·8	38·2	33·5	55·0	48·8	38·0	10·0	8
24·8	55·7	56·4	55·0	29·0	9·6	3·1	22·3	9·1	30·0	42·1	40·5	39·0	34·3	41·1	39·0	37·7	34·9	49·8	45·2	43·0	17·0	8
19·8	52·1	52·1	50·0	26·6	7·0	2·0	20·0	7·1	28·0	44·9	40·8	40·0	34·2	43·1	39·4	—	35·7	45·0	40·0	42·7	12·4	8
23·2	53·3	55·0	51·4	22·8	10·0	2·9	20·3	9·1	29·0	43·0	—	—	34·1	42·4	38·0	38·0	34·1	49·1	44·8	—	—	8
25·5	62·8	63·1	55·4	28·8	8·0	2·6	20·5	8·5	27·0	45·0	41·0	39·0	35·0	44·2	41·7	39·0	34·0	58·1	53·8	40·8	15·5	8
22·7	51·0	51·2	50·1	23·5	6·3	1·8	20·0	8·9	27·0	43·5	40·0	38·8	34·7	41·0	38·2	37·0	36·0	47·8	43·2	37·2	12·8	8
20·1	51·3	52·0	51·0	29·8	9·0	2·2	—	—	—	45·9	—	—	34·0	45·6	—	—	33·3	52·0	47·7	41·1	11·8	8
15·4	48·9	49·0	47·4	25·0	9·3	2·6	22·0	10·0	34·0	40·9	—	—	32·8	41·0	37·3	37·3	32·8	45·5	43·0	42·1	10·2	8
19·0	48·3	48·8	47·0	29·5	7·8	1·3	24·0	8·0	31·5	42·9	38·8	—	32·8	42·0	38·4	—	32·8	49·8	46·0	40·0	10·0	8
20·0	53·1	52·5	54·0	26·9	9·6	3·2	21·2	9·7	29·0	44·2	42·0	40·7	34·3	43·3	42·0	39·8	35·0	54·6	49·1	42·7	14·1	8
23·5	51·5	51·7	50·3	23·8	7·0	3·0	21·8	10·2	32·0	43·8	38·0	38·0	34·2	43·0	38·2	38·2	35·8	49·3	44·6	43·0	13·6	8
14·7	47·0	46·8	45·0	28·9	8·0	3·0	24·0	9·0	31·0	44·0	—	39·4	32·4	43·8	—	38·8	33·3	51·7	45·8	—	—	7
21·9	52·0	52·0	49·8	29·0	8·7	2·0	26·7	8·1	32·0	43·0	—	39·3	30·5	42·0	—	38·0	32·0	51·2	46·8	41·0	13·0	—
20·8	52·5	52·0	50·1	26·8	5·5	2·5	21·0	11·7	31·0	43·2	40·6	39·9	35·1	42·7	39·8	38·9	34·9	44·0	41·7	39·5	—	8
18·9	48·5	48·7	45·5	26·4	7·2	2·1	22·6	6·0	27·5	41·6	38·6	38·6	35·7	40·6	36·1	—	36·1	47·8	44·0	—	—	8
19·5	49·0	48·9	47·3	26·1	11·4	1·3	25·0	8·0	31·0	42·5	39·9	39·9	34·7	42·0	38·4	38·4	34·0	45·0	42·0	37·0	8·3	7
21·4	50·4	50·1	48·2	29·1	6·0	2·0	22·6	5·1	24·5	43·3	41·0	39·1	33·6	43·9	41·0	—	33·6	49·4	44·9	39·3	—	—
12·8	57·2	57·2	54·7	29·8	7·0	2·8	20·5	7·8	27·0	42·7	39·0	39·0	33·9	41·8	37·4	37·4	33·0	50·8	47·0	43·2	13·8	8
23·3	50·0	50·3	49·0	26·7	9·5	2·5	21·3	8·7	28·0	40·9	39·6	38·0	35·0	41·0	38·9	38·0	34·4	56·8	53·0	40·5	11·9	7
18·0	55·5	54·9	51·7	25·5	7·0	3·0	24·0	8·4	29·0	46·8	44·0	43·0	35·0	44·8	42·2	41·5	34·8	45·0	41·4	43·0	15·8	—
17·0	51·0	50·9	52·0	27·5	12·5	5·0	21·4	9·1	28·0	42·4	40·0	38·8	32·3	42·2	40·0	38·0	32·7	52·8	50·3	46·0	13·0	7
16·0	52·0	52·0	50·5	24·8	5·7	3·0	19·3	10·2	29·0	43·1	40·0	38·8	32·7	42·0	38·7	38·0	33·0	48·5	45·2	44·1	12·8	8
17·9	53·0	53·3	51·0	28·8	9·6	3·2	23·0	11·2	33·0	43·2	38·2	38·2	32·8	41·8	37·8	37·8	33·5	52·0	48·0	42·2	14·2	8
18·0	53·1	51·5	48·0	27·3	8·6	1·1	22·0	6·4	26·5	44·4	41·0	41·0	34·3	44·0	39·6	39·6	34·8	52·9	48·3	37·9	12·1	7
14·7	56·0	55·0	51·4	28·0	5·8	2·5?	19·8	5·0	23·5	41·8	38·7	38·7	36·5	41·0	38·1	38·1	35·1	51·2	46·0	41·0	13·2	8
21·7	52·7	53·0	50·0	26·2	6·2	1·5	22·3	6·2	26·5	42·9	40·4	39·8	32·8	42·1	40·2	39·7	33·0	50·0	46·5	43·8	16·3	8
24·0	55·3	55·1	52·5	28·0	7·3	3·8	21·2	8·3	28·5	46·3	43·0	—	35·2	45·2	43·0	—	34·0	54·5	49·5	43·0	12·6	8
22·2	49·0	48·5	47·0	23·6	5·0	1·5	21·0	9·0	27·5	43·2	—	38·5	33·9	42·0	—	37·9	34·6	49·3	48·3	43·3	15·4	7
20·5	48·7	48·8	45·0	27·0	10·2	3·4	21·5	9·5	30·0	43·9	—	39·5	30·9	43·6	—	39·5	30·2	50·0	45·2	—	—	8
18·4	49·1	49·8	47·7	26·1	10·0	1·7	21·4	7·5	28·0	43·9	—	—	33·5	44·3	—	—	33·7	48·5	44·8	—	—	8
22·3	62·3	61·3	55·2	25·8	9·7	3·0	23·0	8·8	31·0	45·7	—	42·7	37·4	44·1	—	40·8	37·4	50·5	46·8	44·3	—	—
16·0	55·5	55·5	54·3	25·0	10·7	2·6	20·4	8·0	27·0	43·0	40·0	38·8	34·0	41·4	38·5	36·5	36·2	54·0	50·6	40·6	13·2	8
19·7	52·2	53·0	49·0	25·1	11·0	3·0	22·3	7·6	29·0	43·8	39·8	39·8	34·5	42·2	39·0	39·0	34·5	48·1	44·6	39·8	12·1	8
24·3	62·5	63·1	62·0	28·7	8·2	3·0	27·0	8·3	32·0	45·0	41·9	41·2	36·6	43·3	39·2	38·9	37·2	55·0	51·7	44·5	—	8
15·6	55·8	55·8	54·9	25·8	11·8	3·4	22·0	9·2	29·0	44·0	40·3	40·1	35·0	43·1	—	39·2	35·2	52·5	48·0	43·0	14·4	8
16·0	49·0	49·8	47·0	25·0	7·0	2·2	—	—	—	42·9	—	—	34·9	42·3	—	—	35·6	46·2	42·8	38·0	10·5	8
16·0	53·0	52·8	52·0	27·0	7·9	1·3	21·5	9·0	30·0	42·2	38·2	38·2	35·1	42·2	37·7	37·7	34·0	52·2	48·6	40·0	10·2	8

asse. Java—Männer.

G_1'	G_2	EH	$P\angle$	*Pros.* $P\angle$	$100\frac{B}{L}$	$100\frac{H'}{L}$	$100\frac{B}{H'}$	$100\frac{B-H'}{L}$	*Oc. I.*	$100\frac{G'H}{GB}$	$100\frac{NB}{NHR}$	$100\frac{NB}{NH'}$	$100\frac{DS}{DC}$	$100\frac{SS}{SC}$	$100\frac{O_2}{O_1R}$	10
39·1	39·0	12·8	83°·5	82°·9	88·4	84·8	104·2	3·5	71·3	69·5	45·5	48·0	38·7	29·2	88·5	
48·6	42·0	13·0	83°·7	82°·0	82·5	81·4	101·5	1·2	62·5	75·6	48·6	51·1	38·2	43·9	78·0	
43·9	43·8	11·8	85°·1	83°·8	80·2	78·8	101·8	1·4	67·2	69·0	51·1	52·4	39·1	36·4	82·4	
51·5	43·1	15·0	86°·4	84°·9	80·9	78·7	102·8	2·2	61·1	71·2	51·1	54·3	40·3	36·8	75·6	
43·0	38·0	12·9	85°·0	82°·6	85·2	74·5	114·2	10·6	69·1	67·1	44·9	49·5	40·8	37·8	75·7	
48·0	39·6	9·8	80°·0	78°·0	78·3	74·9	104·6	3·4	66·0	62·4	65·8	66·5	40·9	34·1	71·9	
45·8	36·5	11·7	86°·0	85°·4	82·5	75·4	109·5	7·2	63·5	76·0	50·9	54·2	27·4	22·9	81·1	
42·3	38·8	10·0	80°·2	78°·8	79·1	80·2	98·6	−1·1	66·7	64·8	49·3	51·2	—	28·3	76·7	
42·2	36·0	11·8	88°·7	86°·9	85·2	83·4	102·2	1·8	71·5	70·6	51·4	52·9	36·0	18·3	80·3	
40·2	38·2	8·8	85°·8	83°·8	79·7	77·1	103·3	2·5	63·0	71·7	44·5	45·3	52·9	38·9	88·0	
47·0	38·6	14·7	86°·7	84°·0	77·3	73·4	105·3	3·9	60·7	67·6	52·8	53·1	—	23·7	74·1	
46·9	38·0	10·2	82°·3	81°·5	84·4	75·9	111·2	8·5	59·9	71·4	49·5	50·2	26·1	30·0	80·0	
45·5	43·2	12·0	87°·4	85°·5	86·1	79·2	108·8	6·9	68·2	71·2	49·7	49·4	34·8	17·2	83·6	
45·8	38·5	7·0	86°·0	83°·7	78·6	78·6	100·0	0·0	62·4	68·2	53·7	57·8	41·9	46·2	79·3	
47·0	42·9	11·6	80°·0	79°·0	75·2	80·1	93·9	−4·9	62·4	77·1	57·4	60·6	44·0	45·0	80·2	
46·6	—	—	82°·0	76°·7	86·3	80·4	107·3	5·9	68·7	65·9	55·2	57·1	38·9	—	82·7	
49·1	41·0	11·5	82°·0	80°·0	85·4	81·7	104·5	3·7	63·3	71·9	50·7	53·8	37·8	29·4	73·3	
48·3	43·5	11·8	82°·0	80°·8	82·6	79·6	103·7	3·0	64·2	67·5	51·0	53·8	39·2	29·1	75·7	
46·2	38·5	12·3	82°·9	81°·0	81·5	76·3	106·8	5·2	61·9	74·5	49·8	51·9	40·8	50·0	82·3	
42·0	—	—	88°·7	83°·8	91·7	81·2	112·9	10·5	68·0	66·6	54·2	55·6	32·3	42·1	79·1	
43·0	40·9	11·2	87°·9	86°·9	86·8	81·3	106·7	5·5	71·3	71·2	45·9	50·7	42·3	40·5	81·3	
47·8	40·0	13·7	85°·9	84°·9	83·8	75·1	111·5	8·7	61·7	72·1	54·9	56·6	37·6	30·0	79·5	
46·1	42·0	11·8	81°·5	80°·0	89·3	83·1	107·4	6·1	61·2	71·2	51·1	51·0	—	41·5	73·8	
43·9	37·8	8·0	85°·0	83°·0	83·8	74·0	113·2	9·7	61·7	65·4	51·7	53·1	44·0	—	79·3	
42·6	46·8	16·3	85°·9	83°·9	80·7	77·0	104·9	3·7	61·0	79·6	45·6	48·1	34·8	34·0	89·0	
50·0	40·7	13·0	88°·0	86°·9	70·8	76·2	92·8	−5·5	64·1	68·3	48·0	48·9	53·3	56·2	77·6	
50·0	40·6	9·8	78°·0	77°·3	83·6	79·2	105·6	4·5	64·2	63·5	56·9	56·1	25·4	—	76·1	
47·2	43·8	13·2	84°·5	84°·0	78·8	77·1	102·0	1·7	69·1	67·6	51·8	55·0	39·6	26·3	74·9	
48·8	38·0	10·0	81°·9	80°·0	82·7	76·9	107·5	5·8	61·1	72·3	51·5	51·6	38·3	31·0	78·7	
45·2	43·0	17·0	84°·1	83°·6	84·7	74·4	113·8	10·3	68·5	78·5	52·1	52·7	40·8	32·3	81·5	
40·0	42·7	12·4	85°·5	84°·6	75·8	76·1	99·6	−0·3	63·8	74·0	51·0	53·2	35·5	28·6	76·2	
44·8	—	—	84°·2	81°·0	86·6	83·7	103·5	2·0	75·9	76·4	42·8	44·4	44·8	29·0	79·3	
53·8	40·8	15·5	82°·0	80°·0	74·9	70·4	106·3	4·5	62·6	81·4	45·9	52·0	41·5	32·5	77·8	
43·2	37·2	12·8	82°·0	79°·9	79·2	77·5	102·2	1·7	70·3	78·2	46·1	46·9	44·5	28·6	79·8	
47·7	41·1	11·8	84°·0	82°·9	80·8	76·3	105·8	4·4	66·3	69·3	58·1	58·4	—	24·4	74·1	
43·0	42·1	10·2	83°·0	81°·9	84·1	82·2	102·2	1·8	68·4	66·1	51·1	52·7	45·5	28·0	80·2	
46·0	40·0	10·0	82°·6	79°·5	76·8	79·4	96·7	−2·6	72·0?	63·1	61·1	62·8	33·3	16·7	76·5	
49·1	42·7	14·1	89°·8	88°·0	81·5	79·0	103·2	2·5	64·0	68·1	50·7	49·8	45·8	33·3	77·6	
44·6	43·0	13·6	85°·9	85°·5	81·2	77·3	105·0	3·9	63·9	75·2	46·2	47·3	46·8	42·9	78·1	
45·8	—	—	74°·9	73°·0	82·9	80·2	103·3	2·7	67·5	59·2	61·5	64·2	37·5	37·5	73·6	
46·8	41·0	13·0	—	—	82·8	—	—	—	63·9	70·2	55·8	58·2	30·3	23·0	70·9	
41·7	39·5	—	81°·5	80°·0	83·6	80·1	104·4	3·5	63·2	76·6	51·0	53·5	55·7	45·5	81·3	
44·0	—	—	83°·0	81°·0	81·4	73·7	110·3	7·6	62·4	63·4	54·4	58·0	26·5	29·2	85·8	
42·0	37·0	8·3	79°·0	78°·5	93·0	84·7	109·8	8·3	69·5	66·5	53·3	55·2	32·0	11·4	81·6	
44·9	39·3	—	—	—	80·8	—	—	—	71·5	70·3	57·7	60·4	22·6	33·3	77·6	
47·0	43·2	13·8	86°·0	84°·0	75·8	72·0	105·2	3·8	58·7	67·1	52·1	54·5	38·0	40·0	79·4	
53·0	40·5	11·9	79°·0	77°·9	73·5	76·8	95·8	−3·2	68·9	75·9	53·4	54·5	40·8	26·3	85·6	
41·4	43·0	15·8	—	—	87·0	76·9	113·2	10·1	61·4	61·9	45·9	49·3	35·0	42·9	74·8	
50·3	46·0	13·0	79°·3	77°·2	78·2	71·3	109·7	6·9	57·5	69·2	53·9	52·9	42·5	40·0	76·2	
45·2	44·1	12·8	84°·3	81°·9	80·4	80·9	99·3	−0·6	69·1	64·6	47·7	49·1	52·8	52·6	75·9	
48·0	42·2	14·2	81°·7	80°·0	76·4	74·5	102·6	1·9	59·7	64·9	54·3	56·5	48·7	33·3	75·9	
48·3	37·9	12·1	79°·3	77°·0	74·6	76·2	97·8	−1·6	61·0	65·7	51·4	56·9	29·1	12·8	77·3	
46·0	41·0	13·2	81°·6	80°·1	88·6	81·5	108·6	7·0	69·8	66·5	50·0	54·5	25·3	43·1	87·3	
46·5	43·8	16·3	80°·0	76°·1	86·5	85·6	101·1	0·9	66·4	71·3	49·7	52·4	27·8	24·2	76·5	
49·5	43·0	12·6	88°·0	86°·0	83·1	81·4	102·1	1·7	64·6	72·2	50·6	53·3	39·2	52·1	76·0	
48·3	43·3	15·4	79°·0	77°·9	82·1	79·8	103·0	2·4	64·4	66·3	48·2	50·2	42·9	30·0	78·5	
45·2	—	—	81°·0	79°·3	84·3	71·7	117·5	12·6	59·6	64·5	55·4	60·0	44·2	33·3	70·4	
44·8	—	—	83°·0	79°·9	84·5	78·2	108·1	6·3	65·0	69·6	53·2	54·7	35·0	17·0	76·3	
46·8	44·3	—	—	—	85·0	—	—	—	71·1	76·7	41·4	46·7	38·3	30·9	81·8	
50·6	40·6	13·2	82°·0	79°·4	84·9	78·5	108·1	6·4	68·0	74·8	45·0	46·0	39·2	24·3	79·1	
44·6	39·8	12·1	84°·0	82°·4	87·4	78·4	111·5	9·0	75·0	71·4	48·1	51·2	34·1	27·3	78·8	
51·7	44·5	—	82°·2	79°·5	72·7	69·3	104·8	3·4	56·1	84·4	45·9	46·3	30·7	36·6	81·3	
48·0	43·0	14·4	87°·0	85°·9	78·8	75·0	105·1	3·8	65·8	69·8	46·2	47·0	41·8	28·8	79·5	
42·8	38·0	10·5	80°·0	78°·0	87·1	84·7	102·9	2·5	76·5	68·8	51·0	53·2	—	31·4	81·4	
48·6	40·0	10·2	82°·5	80°·2	79·8	75·9	105·2	4·0	60·6	71·2	50·9	51·9	41·9	16·5	83·2	

$100\frac{O_2}{O_1R}$	$100\frac{O_2}{Lacr.\ O_1R}$	$100\frac{O_2}{O_1L}$	$100\frac{G_2}{G_1}$	$100\frac{G_2}{G_1'}$	$100\frac{fmb}{fml}$	$B\angle$	$A\angle$	$N\angle$	$100\frac{EH}{G_2}$	Aufschriften der S
88·5	100·9	92·7	92·9	99·7	94·7	42°·0	75°·1	62°·9	32·8	Dja Orbroeng, natus Tagal, Batavia, Swav
78·0	86·5	82·7	77·9	86·4	76·5	43°·7	66°·7	69°·6	31·0	Tjokrodiwirio, natus Tagal, Batavia, 1867,
82·4	89·2	83·3	92·2	99·8	86·6	39°·3	74°·1	66°·6	26·9	Wanadita, natus Pamelang, Tagal, Batavi
75·6	85·2	78·0	78·4	83·7	78·9	43°·5	71°·1	65°·4	34·8	Pa Kendan, natus Pekalongan, Swaving.
75·7	86·5	77·4	79·2	88·4	80·1	41°·1	69°·5	69°·4	33·9	Markoena, natus Pekalongan, Batavia, 11.
71·9	81·5	78·1	76·4	82·5	88·4	36°·6	70°·7	72°·7	24·6	—— natus Pekalongan.
81·1	90·6	85·1	76·0	79·7	86·6	43°·3	71°·9	64°·8	32·1	Tar, maniacus, natus Tagal, Batavia, 1862
76·7	—	81·8	82·9	91·7	80·5	42°·1	72°·0	65°·9	25·8	Ming, maniacus, natus Tagal, Batavia, 186
80·3	90·2	76·1	78·3	85·3	85·5	44°·1	74°·5	61°·4	32·8	
88·0	95·5	87·8	87·4	95·0	85·5	42°·9	75°·3	61°·8	23·0	
74·1	82·1	76·7	76·9	82·1	84·5	40°·6	71°·6	67°·8	38·1	Djoem, maniacus, natus Pekalongan, Bata
80·0	87·6	82·8	77·6	81·0	82·7	42°·6	67°·2	70°·2	26·8	Kassiem, maniacus, natus Pekalongan, Sw
83·6	95·3	84·2	88·2	94·9	88·0	40°·7	72°·6	66°·7	27·8	Kamsoe Jai, maniacus, natus Pekalongan,
79·3	87·4	85·4	80·4	84·1	82·7	42°·9	68°·9	68°·2	18·2	
80·2	89·7	80·7	83·6	91·3	82·2	41°·0	69°·0	70°·0	27·0	Kiesangoor, natus Banjoermasin, Batavia,
82·7	84·5	83·5	—	—	77·6	43°·1	64°·3	72°·6	—	
73·3	98·4	74·4	78·8	83·5	90·4	40°·0	69°·6	70°·4	28·0	Soditono, natus Koedoes, Japara, Batavia,
75·7	86·4	82·4	80·3	90·1	88·1	41°·7	66°·2	72°·1	27·1	
82·3	86·9	78·4	75·8	83·3	78·9	43°·1	68°·7	68°·2	31·9	Kerto Hito, natus Djokjokerto, Batavia, 1
79·1	—	76·6	—	—	89·4	39°·1	72°·1	68°·8	—	
81·3	91·5	83·2	88·0	95·1	86·0	44°·2	74°·1	61°·7	27·4	Kertoarma, natus Djokjakarta, Swaving.
79·5	87·8	82·5	78·4	83·7	86·3	44°·4	66°·9	68°·7	34·3	Kerto Sentico, natus Djakja, Swaving.
73·8	—	75·5	87·0	91·1	84·8	42°·0	69°·4	68°·6	28·1	Soeta Dewerijoe, natus Soerakarta, Batavi
79·3	87·8	81·3	76·2	86·1	79·7	42°·3	69°·2	68°·5	21·2	
89·0	98·4	92·9	98·1	109·9	83·6	49°·5	68°·6	61°·9	34·8	
77·6	85·1	77·8	76·1	81·4	72·0	40°·0	76°·0	64°·0	31·9	
76·1	87·5	72·6	72·6	81·2	83·4	39°·8	66°·4	73°·8	24·1	Kriolersar, natus Polorogo (Madioen), Bat
74·9	84·4	80·9	82·5	92·8	75·6	42°·2	68°·1	69°·7	30·1	Rogontico, natus Madioen, Batavia, 24. i. '
78·7	—	79·6	69·1	77·9	81·0	44°·4	66°·8	68°·8	26·3	Bilok., natus Madioen, Batavia, 1. iv. '20,
81·5	87·9	84·9	86·3	95·1	82·0	45°·1	67°·3	67°·6	39·5	
76·2	85·5	82·8	94·9	106·8	83·6	45°·1	72°·3	62°·6	29·0	Wierokrono, natus Bodjonegoro, Rembang,
79·3	—	80·4	—	—	76·9	46°·5	67°·2	66°·3	—	Asnan II, natus Soerabaija, Batavia, 1860,
77·8	89·7	76·9	70·2	75·8	85·1	45°·0	71°·0	64°·0	38·0	Sariman, natus Soerabaija, Batavia, 27. vi
79·8	89·4	87·8	77·8	86·1	85·1	45°·6	68°·3	66°·1	34·4	Kassidin, natus Modjokerto, Soerabaija, B
74·1	—	73·0	79·0	86·2	91·7	41°·8	70°·1	68°·1	28·7	Pa Ero, idiota, natus Soerabaija, Batavia,
80·2	—	80·0	92·5	97·9	85·2	39°·5	73°·0	67°·5	24·2	Nagalieman, maniacus, natus Passoeroean
76·5	—	78·1	80·3	87·0	88·8	41°·9	68°·5	69°·6	25·0	Ex Java, Anno 1626 missus. a D. Justo H
77·6	84·3	80·8	78·2	87·0	83·8	38°·7	75°·7	65°·6	33·0	Java, voy, Blume.
78·1	90·0	83·3	87·2	96·4	79·4	43°·9	74°·0	62°·1	31·6	Serang, ex insula Java, Batavia, 12. i. '67,
73·6	82·2	76·0	—	—	89·2	36°·0	69°·6	74°·4	—	Maarnatie, ex insula Java, Batavia, ix. '68,
70·9	77·6	76·2	80·1	87·6	85·7	40°·5	67°·5	72°·0	31·7	Jandjoer, natus Java, Swaving.
81·3	88·0	81·7	89·8	94·7	81·9	48°·5	68°·4	63°·1	—	Kertobiongo, Swaving-Z.
85·8	92·5	88·9	—	—	86·3	40°·1	73°·2	66°·7	—	Java.
81·6	87·0	81·0	82·2	88·1	82·5	44°·2	70°·6	65°·2	22·4	Java.
77·6	85·9	76·5	79·6	87·5	74·1	42°·0	69°·0	69°·0	—	
79·4	86·9	78·9	84·8	91·7	87·6	40°·0	73°·0	67°·0	32·0	
85·6	92·1	83·9	71·3	76·4	91·2	40°·2	69°·8	70°·0	29·4	
74·8	81·4	77·7	95·6	103·9	85·3	42°·7	77°·3	60°·0	36·7	Cr. Javanensis, Dr J. Peitoel (?).
76·2	83·2	77·5	87·1	91·5	79·1	40°·3	65°·5	74°·2	28·3	
75·9	84·3	78·6	90·9	97·6	80·6	39°·6	73°·7	66°·7	29·0	
75·9	85·9	80·1	81·2	87·9	82·8	40°·3	67°·5	72°·2	33·6	Javaan, Krommo van Wadjak op Java.
77·3	83·7	79·1	71·6	78·5	83·8	38°·4	72°·6	69°·0	31·9	Java.
87·3	94·3	85·6	80·1	89·1	88·9	41°·0	69°·6	69°·4	32·2	Javaan.
76·5	82·4	78·4	87·6	94·2	87·3	44°·5	68°·5	67°·0	37·2	Javaan.
76·0	—	75·2	78·9	86·9	95·8	44°·5	73°·0	62°·5	29·3	Sundaicus, Swaving-Z.
78·5	88·1	82·4	87·8	89·6	83·3	42°·8	66°·5	70°·7	35·6	
70·4	78·2	69·3	—	—	85·8	39°·2	65°·1	75°·7	—	
76·3	—	76·1	—	—	80·0	40°·5	73°·8	65°·7	—	
81·8	87·6	84·8	87·7	94·7	82·1	48°·2	71°·3	60°·5	—	
79·1	87·6	87·4	75·2	80·2	85·6	40°·5	67°·7	71°·8	32·5	Japar Berwoko, Java, Swaving.
78·8	86·7	81·8	82·7	89·2	85·6	42°·8	72°·0	65°·2	30·4	Een onbekende inlander, Swaving, Batavi
81·3	88·8	85·9	80·9	86·1	73·7	49°·6	63°·7	66°·7	—	Malayer.
79·5	87·3	81·7	81·9	89·6	84·6	41°·1	74°·0	64°·9	33·5	Malayer.
81·4	—	84·2	82·3	88·8	82·1	41°·5	71°·4	67°·1	27·6	Sonjogo, natus Java, Batavia, Swaving.
83·2	91·9	80·6	76·6	82·3	83·9	40°·5	72°·2	67°·3	25·5	

$100\frac{NB}{NHR}$	$100\frac{NB}{NH'}$	$100\frac{DS}{DC}$	$100\frac{SS}{SC}$	$100\frac{O_2}{O_1R}$	$100\frac{O_2}{Lacr.\ O_1R}$	$100\frac{O_2}{O_1L}$	$100\frac{G_2}{G_1}$	$100\frac{G_2}{G_1'}$	$100\frac{fmb}{fml}$	$B\angle$	$A\angle$	$N\angle$	$100\frac{EH}{G_2}$
45·5	48·0	38·7	29·2	88·5	100·9	92·7	92·9	99·7	94·7	42°·0	75°·1	62°·9	32·8
48·6	51·1	38·2	43·9	78·0	86·5	82·7	77·9	86·4	76·5	43°·7	66°·7	69°·6	31·0
51·1	52·4	39·1	36·4	82·4	89·2	83·3	92·2	99·8	86·6	39°·3	74°·1	66°·6	26·9
51·1	54·3	40·3	36·8	75·6	85·2	78·0	78·4	83·7	78·9	43°·5	71°·1	65°·4	34·8
44·9	49·5	40·8	37·8	75·7	86·5	77·4	79·2	88·4	80·1	41°·1	69°·5	69°·4	33·9
65·8	66·5	40·9	34·1	71·9	81·5	78·1	76·4	82·5	88·4	36°·6	70°·7	72°·7	24·6
50·9	54·2	27·4	22·9	81·1	90·6	85·1	76·0	79·7	86·6	43°·3	71°·9	64°·8	32·1
49·3	51·2	—	28·3	76·7	—	81·8	82·9	91·7	80·5	42°·1	72°·0	65°·9	25·8
51·4	52·9	36·0	18·3	80·3	90·2	76·1	78·3	85·3	85·5	44°·1	74°·5	61°·4	32·8
44·5	45·3	52·9	38·9	88·0	95·5	87·8	87·4	95·0	85·5	42°·9	75°·3	61°·8	23·0
52·8	53·1	—	23·7	74·1	82·1	76·7	76·9	82·1	84·5	40°·6	71°·6	67°·8	38·1
49·5	50·2	26·1	30·0	80·0	87·6	82·8	77·6	81·0	82·7	42°·6	67°·2	70°·2	26·8
49·7	49·4	34·8	17·2	83·6	95·3	84·2	88·2	94·9	88·0	40°·7	72°·6	66°·7	27·8
53·7	57·8	41·9	46·2	79·3	87·4	85·4	80·4	84·1	82·7	42°·9	68°·9	68°·2	18·2
57·4	60·6	44·0	45·0	80·2	89·7	80·7	83·6	91·3	82·2	41°·0	69°·0	70°·0	27·0
55·2	57·1	38·9	—	82·7	84·5	83·5	—	—	77·6	43°·1	64°·3	72°·6	—
50·7	53·8	37·8	29·4	73·3	98·4	74·4	78·8	83·5	90·4	40°·0	69°·6	70°·4	28·0
51·0	53·8	39·2	29·1	75·7	86·4	82·4	80·3	90·1	88·1	41°·7	66°·2	72°·1	27·1
49·8	51·9	40·8	50·0	82·3	86·9	78·4	75·8	83·3	78·9	43°·1	68°·7	68°·2	31·9
54·2	55·6	32·3	42·1	79·1	—	76·6	—	—	89·4	39°·1	72°·1	68°·8	—
45·9	50·7	42·3	40·5	81·3	91·5	83·2	88·0	95·1	86·0	44°·2	74°·1	61°·7	27·4
54·9	56·6	37·6	30·0	79·5	87·8	82·5	78·4	83·7	86·3	44°·4	66°·9	68°·7	34·3
51·1	51·0	—	41·5	73·8	—	75·5	87·0	91·1	84·8	42°·0	69°·4	68°·6	28·1
51·7	53·1	44·0	—	79·3	87·8	81·3	76·2	86·1	79·7	42°·3	69°·2	68°·5	21·2
45·6	48·1	34·8	34·0	89·0	98·4	92·9	98·1	109·9	83·6	49°·5	68°·6	61°·9	34·8
48·0	48·9	53·3	56·2	77·6	85·1	77·8	76·1	81·4	72·0	40°·0	76°·0	64°·0	31·9
56·9	56·1	25·4	—	76·1	87·5	72·6	72·6	81·2	83·4	39°·8	66°·4	73°·8	24·1
51·8	55·0	39·6	26·3	74·9	84·4	80·9	82·5	92·8	75·6	42°·2	68°·1	69°·7	30·1
51·5	51·6	38·3	31·0	78·7	—	79·6	69·1	77·9	81·0	44°·4	66°·8	68°·8	26·3
52·1	52·7	40·8	32·3	81·5	87·9	84·9	86·3	95·1	82·0	45°·1	67°·3	67°·6	39·5
51·0	53·2	35·5	28·6	76·2	85·5	82·8	94·9	106·8	83·6	45°·1	72°·3	62°·6	29·0
42·8	44·4	44·8	29·0	79·3	—	80·4	—	—	76·9	46°·5	67°·2	66°·3	—
45·9	52·0	41·5	32·5	77·8	89·7	76·9	70·2	75·8	85·1	45°·0	71°·0	64°·0	38·0
46·1	46·9	44·5	28·6	79·8	89·4	87·8	77·8	86·1	85·1	45°·6	68°·3	66°·1	34·4
58·1	58·4	—	24·4	74·1	—	73·0	79·0	86·2	91·7	41°·8	70°·1	68°·1	28·7
51·1	52·7	45·5	28·0	80·2	—	80·0	92·5	97·9	85·2	39°·5	73°·0	67°·5	24·2
61·1	62·8	33·3	16·7	76·5	—	78·1	80·3	87·0	88·8	41°·9	68°·5	69°·6	25·0
50·7	49·8	45·8	33·3	77·6	84·3	80·8	78·2	87·0	83·8	38°·7	75°·7	65°·6	33·0
46·2	47·3	46·8	42·9	78·1	90·0	83·3	87·2	96·4	79·4	43°·9	74°·0	62°·1	31·6
61·5	64·2	37·5	37·5	73·6	82·2	76·0	—	—	89·2	36°·0	69°·6	74°·4	—
55·8	58·2	30·3	23·0	70·9	77·6	76·2	80·1	87·6	85·7	40°·5	67°·5	72°·0	31·7
51·0	53·5	55·7	45·5	81·3	88·0	81·7	89·8	94·7	81·9	48°·5	68°·4	63°·1	—
54·4	58·0	26·5	29·2	85·8	92·5	88·9	—	—	86·3	40°·1	73°·2	66°·7	—
53·3	55·2	32·0	11·4	81·6	87·0	81·0	82·2	88·1	82·5	44°·2	70°·6	65°·2	22·4
57·7	60·4	22·6	33·3	77·6	85·9	76·5	79·6	87·5	74·1	42°·0	69°·0	69°·0	—
52·1	54·5	38·0	40·0	79·4	86·9	78·9	84·8	91·7	87·6	40°·0	73°·0	67°·0	32·0
53·4	54·5	40·8	26·3	85·6	92·1	83·9	71·3	76·4	91·2	40°·2	69°·8	70°·0	29·4
45·9	49·3	35·0	42·9	74·8	81·4	77·7	95·6	103·9	85·3	42°·7	77°·3	60°·0	36·7
53·9	52·9	42·5	40·0	76·2	83·2	77·5	87·1	91·5	79·1	40°·3	65°·5	74°·2	28·3
47·7	49·1	52·8	52·6	75·9	84·3	78·6	90·9	97·6	80·6	39°·6	73°·7	66°·7	29·0
54·3	56·5	48·7	33·3	75·9	85·9	80·1	81·2	87·9	82·8	40°·3	67°·5	72°·2	33·6
51·4	56·9	29·1	12·8	77·3	83·7	79·1	71·6	78·5	83·8	38°·4	72°·6	69°·0	31·9
50·0	54·5	25·3	43·1	87·3	94·3	85·6	80·1	89·1	88·9	41°·0	69°·6	69°·4	32·2
49·7	52·4	27·8	24·2	76·5	82·4	78·4	87·6	94·2	87·3	44°·5	68°·5	67°·0	37·2
50·6	53·3	39·2	52·1	76·0	—	75·2	78·9	86·9	95·8	44°·5	73°·0	62°·5	29·3
48·2	50·2	42·9	30·0	78·5	88·1	82·4	87·8	89·6	83·3	42°·8	66°·5	70°·7	35·6
55·4	60·0	44·2	33·3	70·4	78·2	69·3	—	—	85·8	39°·2	65°·1	75°·7	—
53·2	54·7	35·0	17·0	76·3	—	76·1	—	—	80·0	40°·5	73°·8	65°·7	—
41·4	46·7	38·3	30·9	81·8	87·6	84·8	87·7	94·7	82·1	48°·2	71°·3	60°·5	—
45·0	46·0	39·2	24·3	79·1	87·6	87·4	75·2	80·2	85·6	40°·5	67°·7	71°·8	32·5
48·1	51·2	34·1	27·3	78·8	86·7	81·8	82·7	89·2	85·6	42°·8	72°·0	65°·2	30·4
45·9	46·3	30·7	36·6	81·3	88·8	85·9	80·9	86·1	73·7	49°·6	63°·7	66°·7	—
46·2	47·0	41·8	28·8	79·5	87·3	81·7	81·9	89·6	84·6	41°·1	74°·0	64°·9	33·5
51·0	53·2	—	31·4	81·4	—	84·2	82·3	88·8	82·1	41°·5	71°·4	67°·1	27·6
50·9	51·9	41·9	16·5	83·2	91·9	80·6	76·6	82·3	83·9	40°·5	72°·2	67°·3	25·5

∠	$100\frac{EH}{G_2}$	Aufschriften der Schädel
°·9	32·8	Dja Orbroeng, natus Tagal, Batavia, Swaving.
°·6	31·0	Tjokrodiwirio, natus Tagal, Batavia, 1867, Swaving.
°·6	26·9	Wanadita, natus Pamelang, Tagal, Batavia, 10. xii. '66, Swaving.
°·4	34·8	Pa Kendan, natus Pekalongan, Swaving.
°·4	33·9	Markoena, natus Pekalongan, Batavia, 11. ix. '67, Swaving.
°·7	24·6	—— natus Pekalongan.
°·8	32·1	Tar, maniacus, natus Tagal, Batavia, 1862, Swaving.
°·9	25·8	Ming, maniacus, natus Tagal, Batavia, 1862, Swaving.
°·4	32·8	
°·8	23·0	
°·8	38·1	Djoem, maniacus, natus Pekalongan, Batavia, 1860, Swaving.
°·2	26·8	Kassiem, maniacus, natus Pekalongan, Swaving.
°·7	27·8	Kamsoe Jai, maniacus, natus Pekalongan, Batavia, 1862, Swaving.
°·2	18·2	
°·0	27·0	Kiesangoor, natus Banjoermasin, Batavia, Swaving.
°·6	—	
°·4	28·0	Soditono, natus Koedoes, Japara, Batavia, 5. v. '67, Swaving.
°·1	27·1	
°·2	31·9	Kerto Hito, natus Djokjokerto, Batavia, 12. v. '67, Swaving.
°·8	—	
°·7	27·4	Kertoarma, natus Djokjakarta, Swaving.
°·7	34·3	Kerto Sentico, natus Djakja, Swaving.
°·6	28·1	Soeta Dewerijoe, natus Soerakarta, Batavia, 1860, Swaving.
°·5	21·2	
°·9	34·8	
°·0	31·9	
°·8	24·1	Kriolersar, natus Polorogo (Madioen), Batavia, 1867, Swaving.
°·7	30·1	Rogontico, natus Madioen, Batavia, 24. i. '69, Swaving.
°·8	26·3	Bilok., natus Madioen, Batavia, 1. iv. '20, Swaving.
°·6	39·5	
°·6	29·0	Wierokrono, natus Bodjonegoro, Rembang, Batavia, 1. x. '69, Swaving.
°·3	—	Asnan II, natus Soerabaija, Batavia, 1860, Swaving.
°·0	38·0	Sariman, natus Soerabaija, Batavia, 27. viii. '69, Swaving.
°·1	34·4	Kassidin, natus Modjokerto, Soerabaija, Batavia, 19. v. '69, Swaving.
°·1	28·7	Pa Ero, idiota, natus Soerabaija, Batavia, 22. xii. '60, Swaving.
°·5	24·2	Nagalieman, maniacus, natus Passoeroeang, Swaving.
°·6	25·0	Ex Java, Anno 1626 missus. a D. Justo Heurnio fratre o Heurnii.
°·6	33·0	Java, voy, Blume.
°·1	31·6	Serang, ex insula Java, Batavia, 12. i. '67, Swaving.
°·4	—	Maarnatie, ex insula Java, Batavia, ix. '68, Swaving.
°·0	31·7	Jandjoer, natus Java, Swaving.
°·1	—	Kertobiongo, Swaving-Z.
°·7	—	Java.
°·2	22·4	Java.
°·0	—	
°·0	32·0	
°·0	29·4	
°·0	36·7	Cr. Javanensis, Dr J. Peitoel (?).
°·2	28·3	
°·7	29·0	
°·2	33·6	Javaan, Krommo van Wadjak op Java.
°·0	31·9	Java.
°·4	32·2	Javaan.
°·0	37·2	Javaan.
°·5	29·3	Sundaicus, Swaving-Z.
°·7	35·6	
°·7	—	
°·7	—	
°·5	—	
°·8	32·5	Japar Berwoko, Java, Swaving.
°·2	30·4	Een onbekende inlander, Swaving, Batavia, 22. xii. '64.
°·7	—	Malayer.
°·9	33·5	Malayer.
°·1	27·6	Sonjogo, natus Java, Batavia, Swaving.
°·3	25·5	

	Nr.	L	F	B	H′	H	OH	LB	B′	U	Gl.U	Q′	βQ′	S_1'	S_2'	
BANTAM	38	165	163	137·5	129	131	110	93·1	86·0	481	484	299	300	112·2	101·2	
	41	166	166	157·5	137·5	140·5	124	94·5	99·0	508	510	345	340	111·2	106·6	
	42	178	172·5	135·5	133	134	114	101·4	88·0	493·5	498	309	305	113·0	94·2	
	43	166	164	136	128	127·5	110·5	93·2	85·3	472	474	303	302	107·3	108·0	
	44	164	162·5	137	137	139·5	113	102·0	94·5	470	478	307	303·5	106·3	100·0	
	45	157	157	133	127	127·5	106	95·6	87·0	458	460	293	293	99·9	97·0	
	46	157	153·5	138	134	138	118	95·8	87·6	471	474	316	311	107·4	99·1	
	47	172	172	135·5	137	137·5	119	97·5	83·2	487	487	314	312	104·2	108·0	
	48	162	161	133	130	131	110·5	93·7	89·0	472	474	299	297	108·0	100·0	
	49	183·5	183	139	136·5	136	114	102·7	89·0	510·5	513	311	309	108·2	113·9	
	50	165·5	165	127·5	133	133	112·5	92·3	83·2	455	456	303	301·5	104·4	106·2	
	27	176	176	148	142	141	122	104·0	98·2	520	520	343	342	114·8	113·3	
	28	172·5	171·5	140	132	133·5	111	99·4	95·2	495	499	310	309	106·0	110·4	
	29	168·5	166	143	136	137	112	99·3	88·0	489·5	496	316	316	110·3?	111·2	
	30	166·5	166	139	128	127·5	107	96·0	85·1	485	486	299	304	109·0?	99·3	
	31	183	179·5	145	135·5	135·5	116·5	93·2	85·2	517	521	329	312	109·8	117·5	
	32	171	171	143	140·5	140	118·5	100·4	94·2	501	506	323	325	111·0	111·4	
	33	176	176	138·5	137	136	114	96·7	91·0	489	494	307	308	116·7	113·0	
	34	167	166	144	131·5	131	112·5	95·1	92·0	484	484	311	313	114·0	103·3	
	39	165	164·5	141	136	138	112·5	97·4	92·2	486	488·5	310	311	108·8	106·5	
	51	173·5	171	140	134·5	136	112	101·1	87·0	496	503	310	309	108·1	109·2	
	218	173·5	173	138·5	131	129	109	100·0	97·8	499	502	—	307	101·2	104·0	
BATAVIA	64	165	164·5	140·5	136	137	110	102·3	89·2	475	476	309	309	111·2	97·1	
	66	173	169	138	128	129	106	99·1	91·9	499	504	301	301·5	103·2	106·9	
	67	176	174·5	143	137	139	116·5	98·7	95·2	504	508	320	327	114·1	101·6	
	68	166	165	139·5	143	146·5	119	102·1	98·2	491	493	325	323	111·0	108·3	
	72	168	165·5	157	144·5	145	123	94·6	84·0	512	512	351	345	115·8	101·0	
	73	167·5	166	141	128	127·5	112·5	96·6	92·2	488	492	313	313	108·0	93·5	
	74	182	180	151·5	139	139	110	101·0	97·4	526	529	315	318	113·0	113·5	
	75	166	163	141	136·5	138	114·5	95·0	91·2	482	486	316	311	111·0	102·6	
	77	173	171	138	131	132	112	96·4	88·5	493	496	309	309	108·3	115·0	
	78	172	169	140·5	133	136	116·5	99·1	90·8	494	497	320	310	111·4	103·8	
	81	173·5	173	140	134	136·5	113	98·6	91·5	499	503	310	308·5	108·4	103·0	
	84	157·5	155	137	130·5	133	108	95·5	89·2	471·5	475	301	299·5	103·1	99·2	
	88	156	153	136·5	128	129	108	94·6	83·4	462	462	300	307·5	109·0	95·3	
	90	170	170	137	138·5	140	114	98·7	86·0	—	—	316	315	112·0	107·2	
	105	161	161	138·5	129	132	112	92·7	90·0	475	476	308	301	107·2	104·8	
	58	172	169	158	138·5	140	119	96·0	90·6	511	515	338	339	116·8	106·0	
	59	172·5	169	149	134	134	112·5	100·7	92·6	505	505	321	323	113·0	102·1	
	61	173·5	173	141	137	137	114	102·0	95·1	501	503	314	312	105·2	110·0	
	63	179	178·5	140	134	134	110	95·3	97·0	512	512	309	319	109·4	100·0	
	76	175·5	167	141	135	138·5	117	92·3	92·6	491	495	319	307·5	112·7	110·7	
	79	170·5	171	131	135	136·5	115	97·0	85·0	474	478	306	302	112·1	107·0	
	80	178	177	140·5	141	143	116	101·2	91·3	501	506	314	312	108·0	104·0	
	83	172	171	—	138	136·5	113	102·0	96·0	496	501	320	320	113·0	106·2	
	91	160	159	142	129	130	111·5	92·0	88·8	479	484	311	317	101·0	98·6	
	110	172·5	171·5	134·5	137·5	138·5	112	97·0	93·6	484	488	307	308	110·3	107·8	
	169	179	179	143·5	143·5	145·5	122	102·0	93·0	513	515	337	334	109·0	108·0	
	111	177·5	176	140	142	142	117·5	101·6	96·2	513	514	322	320	109·0	118·0	
	112	172·5	172	136	129	129·5	107·5	96·8	87·0	492	495	297	294	103·0	108·3	
	113	171·5	170	145·5	129	130	111	93·6	91·4	504	510	315	311	112·0	109·0	
	114	166	165	142·5	123	123	101·5	—	93·0	492	494	297	299	107·8	103·1	
	115	159	156	142	137·5	139	119	91·3	91·0	477	481	322	316	107·1	107·0	
	116	170	169·5	151·5	130	130	108·5	89·0	90·0	510	508	315	316	111·3	104·1	
	117	170·5	169	137	135	135	117	98·3	92·8	—	—	—	—	—	98·7	
MADURA	1	166	163	141	133	130·5	114	100·3	85·0	480	485	—	312	113·0	99·2	
	2	169	170	145	132	133	115	98·1	96·0	498	502	—	316	106·0	95·3	
	4	161	163	138	132	132	114	93·0	90·2	482	486	—	310	109·0	101·7	
	6	173	175·5	146	138	138	120·5	98·0	90·0	512	512	—	329	112·8	110·8	
	7	169	167	146	129	129	110	95·0	86·0	495	498	—	313	104·0	105·0	
	8	179	178	142	144	142·5	119	104·3	93·0	513	518	—	325	117·0	116·6	
	9	176	173	143	142	142·5	121	105·0	94·0	506	510	—	330	115·0	110·6	
	10	177	174	137·5	138·5	139·5	112·5	99·0	83·0	499	505	—	307	110·0	109·0	
	11	180	180	149	142	144	126	95·0	92·0	524	526	—	342	124·0	114·0	
	12	168	167·5	147	138·5	140	115	102·0	97·0	501	503	—	322	113·5	108·0	
	13	173	170	139	131·5	132	109·5	98·0	89·7	496	501	—	303	107·0	105·5	
	14	168·5	165	146	136	137	114	97·3	90·0	497	497	—	320	113·8	104·4	
	15	181	182	143	140·5	140	127	104·0	102·0	520	523	—	336	112·0	115·1	
	16	167	165·5	143	130·5	132	115·5	94·3	90·5	492	495	—	315	113·8	104·0	
	17	176	176	141	137	136·5	115·5	100·5	94·1	505	506	—	318	109·6	119·0	

S_1'	S_2'	S_3'	S_1	S_2	S_3	S	*fml*	*fmb*	*G'H*	*J*	*GB*	*GL*	*PH*	*NHR*	*NHL*	*NH'*	*NB*	*SC*	*SS*	*DC*	*DS*	*D*
12·2	101·2	89·8	124	116·5	103	343	37·2	28·1	62·8	137·5	98·0	90·5	16·7	47·4	47·0	45·1	29·2	7·0	1·7	20·0	8·0	2
11·2	106·6	101·3	128·5	125·5	113	367	32·5	27·7	70·4	132	95·0	96·0	25·2	48·2	48·0	43·8	24·5	11·6	2·9	24·4	9·6	3
13·0	94·2	109·2	124·5	102	133	359·5	34·2	29·9	70·0	131	97·0	100·0	18·8	53·8	53·5	50·4	26·5	8·2	2·8	21·0	8·3	2
07·3	108·0	90·0	121	123	105	348	32·3	26·9	60·0	124	97·1	91·4	11·0	48·9	48·1	47·3	26·3	8·6	3·7	—	—	
06·3	100·0	100·0	120·5	115·5	107	342	37·5	31·1	69·0	132·5	95·3	95·5	12·3	54·2	54·2	54·2	24·8	9·5	3·3	19·3	10·4	3
99·9	97·0	88·4	110	107	101	318	34·1	28·2?	68·0	127	96·1	102·0	20·0	48·3	48·9	46·2	26·7	8·5	2·0	18·0	8·2	2
07·4	99·1	99·3	117	116·5	107·5	342	35·0	26·7	72·0	124	94·6	99·0	19·8	53·4	52·2	51·4	26·9	5·9	2·0?	17·0	7·4	2
04·2	108·0	94·7	123·5	124	116	363	31·8	29·0	67·4	123	100·0	90·0	20·5	51·0	51·1	47·1	25·0	8·2	1·9	21·0	8·8	2
08·0	100·0	91·2	126	112	102	340	33·7	30·0	—	126	94·0	—	—	52·0	50·6	46·5	27·0	8·3	3·5	21·0	9·0	2
08·2	113·9	102·0	125·5	128	122	376·5	32·6	25·3?	70·0	132	97·3	100·0	20·7	53·1	50·2	48·6	26·3	10·0	4·0	20·0	13·0	3
04·4	106·2	92·1	116·5	120	106	342·5	34·6	24·9	—	122	93·1	—	—	47·2	47·6	46·1	26·1	7·0	2·0	19·0	9·5	2
14·8	113·3	94·0	132	128	108	368	34·8	26·8	75·0	133	99·0	98·8	22·4	56·7	56·2	52·0	26·0	13·0	3·0	24·0	9·0	3
06·0	110·4	95·1	118	128	107	353	36·2	27·0	70·2	143	108·0	95·9	14·0	55·9	56·1	54·9	23·7	11·0	3·3	22·0	11·2	3
10·3?	111·2	94·7	123	128·5	106	358·5	33·8	29·0	65·0	134	98·5	94·3	18·5	52·0	50·2	47·3	23·5	9·5	3·0	20·0	8·8	2
09·0?	99·3	90·0	126?	110·5	107	345·5	34·0	28·0	69·4	125	92·7	94·6	15·5	54·7	55·0	52·8	—	7·2	4·1	19·0	8·2	2
09·8	117·5	105·3	123	133	120	376	39·1	35·0	78·0	132·5	101·2	94·5	22·0	55·3	55·5	54·5	24·9	6·4	3·0?	19·3	7·1	
11·0	111·4	92·1	126	127	105·5	358·5	35·3	31·0	64·9	136	99·0	94·0	11·7	54·3	54·3	51·2	26·9	8·4	3·2	19·0	7·9	2
16·7	113·0	89·7	133	129	111	373	34·5	25·5	72·2	134	97·0	96·2	25·5	48·8	49·0	45·3	25·0	10·5	3·1	23·8	11·0	3
14·0	103·3	91·1	130·5	118·5	105	354	34·1	27·5	69·3	125·5	92·3	93·9	20·9	50·1	50·9	47·9	24·4	10·3	4·3	21·6	8·0	2
08·8	106·5	88·7	123	122·5	98·5	343·5	38·0	30·0	63·4	131	93·7	96·3	17·0	47·5	48·5	46·4	26·0	9·2	2·2	22·0	7·3	2
08·1	109·2	98·0	117·5	123·5	112	353	39·0	30·9	70·0	135	99·2	104·7	18·1	53·1	53·8	50·9	28·7	8·3	3·2	21·3	9·4	2
01·2	104·0	95·3	119	119	113	351	35·0	31·3	69·0	134·5	97·2	96·0	18·5	50·5	50·7	49·2	26·2	13·0	1·7	27·0	8·6	3
11·2	97·1	85·6	127·5	112·5	95	335	36·0	30·0	71·5	139	98·7	110·3	18·7	52·8	50·8	50·6?	26·1	9·2	3·0	23·0	8·7	3
03·2	106·9	84·2	116	119·5	98	334	41·7	32·9	—	138	95·2	?	—	50·6	51·6	49·3	27·9	10·0	3·4	21·6	9·8	2
14·1	101·6	102·8	127	113	122	363	38·0	29·2	73·8	138·5	101·0	101·3	22·3	—	—	—	26·9	11·0	2·9	23·0	9·5	3
11·0	108·3	96·3	125·5	131	108	363·5	34·7	32·5	72·9	128	98·4	98·2	19·2	52·1	53·0	53·4	24·1	8·0	2·0	20·0	9·4	2
15·8	101·0	109·8	131	111	121	363	36·4	29·0	72·8	132	99·9	91·0	23·0	51·0	50·4	46·1	25·6	6·2	1·3	21·3	8·1	2
08·0	93·5	103·6	124	102	125	351	28·8	27·0	70·9	134	100·0	104·2	22·0	49·5	50·0	48·0	27·0	9·0	2·2	23·0	5·9	2
13·0	113·5	96·0	128	129	110·5	367·5	41·3	30·5	73·0	132	101·6	94·1	18·4	55·5	55·3	53·2	26·6	10·0	2·5	22·0	8·8	2
11·0	102·6	95·0	127	120	106	353	36·0	32·3	68·0	—	99·0	101·2	21·5	47·0	46·5	44·0	28·0	4·6	1·2	22·0	6·5	2
08·3	115·0	92·4	122	131	109	362	35·4	31·8	72·1	133	93·3	97·9	21·3	51·0	51·0	49·2	26·4	8·2	3·7	21·0	9·8	3
11·4	103·8	96·7	123	116·5	107	347	37·1	30·0	78·8	131	100·0	101·7	24·0	53·4	53·8	52·9	25·5	8·0	3·9	23·0	9·5	3
08·4	103·0	106·4	121	115·5	125	360	35·9	30·0	67·8	138	97·7	101·0	14·2	51·1	51·2	50·9	27·8	14·0	2·9	24·3	7·8	2
03·1	99·2	91·7	112	115	101	329	36·6	30·5	68·4	136·5	103·1	94·1	18·0	51·2	49·7	49·2	26·9	5·0	3·0?	19·0	10·0	2
09·0	95·3	83·8	119	110	93	322	32·5	26·9	76·5	123·5	90·1	92·4	22·1	55·6	55·5	54·0	26·5	7·0	2·1	17·0	8·4	2
12·0	107·2	99·0	124	121	112	357	35·0	28·8	70·6	136	96·3	96·3	21·8	50·0	49·0	47·2	24·5	8·6	1·9	21·0	7·5	2
07·2	104·8	89·1	120	122	102	344	36·0	28·9	61·1	123	95·5	90·9	17·0	46·9	47·0	44·6	25·8	6·4	1·5	19·8	6·8	2
16·8	106·0	102·2	131·5	120	119	370	35·9	30·8	71·2	139	104·5	89·2	21·8	51·0	52·0	48·0	24·8	9·8	3·8	21·3	8·2	2
13·0	102·1	99·0	131	115	111·5	356·5	37·3	29·4	74·2	133·5	102·3	100·3	18·5	55·6	55·7	55·4	26·8	7·2	2·8	22·0	9·0	2
05·2	110·0	87·7	120·5	124	106	350·5	39·0	29·2	69·5	135·5	96·0	97·2	23·1	51·9	50·3	47·9	26·9	7·3	3·8	22·3	9·8	2
09·4	100·0	107·0	125·5	107	131	363	35·0	30·8	69·1	132·5	103·1	93·7	19·9	50·0	50·5	47·5	25·9	8·0	3·0	21·8	9·0	2
12·7	110·7	96·1	124	127	106	356	38·0	29·0	64·9	141·5	105·5	91·9	18·8	49·6	48·4	44·3	29·2	6·0	1·0	20·0	7·2	2
12·1	107·0	92·7	131	121	106	358	34·1	27·0	64·7	119	93·1	90·0	14·8	50·3	51·5	49·1	25·5	7·4	2·6	—	—	
08·0	104·0	110·0	122	116	131	369	35·9	30·0	67·4	134	97·7	96·0	14·2	53·0	53·5	51·0	27·3	11·0	3·7	21·0	8·8	
13·0	106·2	91·4	130	118	104	352	33·2	29·5	—	132	103·0	—	—	54·0	52·0	48·5	25·4	—	—	—	—	
01·0	98·6	89·0	113	109	100	322	41·5	30·0	67·5	—	95·5	97·0	18·0	50·4	50·5	49·2	27·5	10·0	2·8	20·0	8·6	
10·3	107·8	95·2	124·5	122	110	357·5	37·3	27·0	66·8	—	106·2	94·2	19·0	50·3	50·1	47·5	27·8	8·0	3·2	24·4	9·6	
09·0	108·0	105·8	124·5	120·5	125	370	37·1	31·0	70·1	137	98·4	101·0	21·6	52·5	52·5	49·0	25·3	7·5	1·8	20·3	7·0	
09·0	118·0	96·7	134·5	128	109	371·5	36·0	29·9	72·3	132	97·0	98·4	21·8	52·1	51·4	51·9	27·0	9·3	2·9	19·0	8·4	
03·0	108·3	86·1	117	120	106	343	35·0	27·3	66·2	139·5	103·8	97·0	16·9	48·5	49·5	48·0	25·6	9·0	4·1	23·0	10·5	
12·0	109·0	93·1	127	125	105	357	37·8	30·2	76·0	138·5	108·0	94·6	18·0	60·0	59·2	58·0	30·0	6·7	3·0	21·8	8·9	
07·8	103·1	84·0	125	118	97	339	36·8	31·3	—	128	—	—	—	51·0	51·9	49·9	27·0	5·2	2·0	19·0	7·2	
07·1	107·0	94·0	119	124	106	349	33·6	29·0	70·3	129	93·2	93·3	24·5	49·0	48·0	46·2	23·4	6·0	2·8	—	—	
11·3	104·1	100·2	129	122·5	114	366	35·8	27·8	73·0	129·5	93·1	90·9	19·1	55·0	56·0	52·0	26·0	—	—	19·6	6·9	
—	98·7	—	—	108·5	—	—	32·0	28·1	71·5	126	97·8	96·2	21·3	53·2	53·2	49·0	26·9	10·2	2·6	23·0	9·0	
13·0	99·2	95·0	127	115	107	349	—	31·5	71·0	134	97·3	95·0	17·4	—	55·3	52·5	26·0	—	—	—	—	
06·0	95·3	109·2	121	106	128	355	36·0	29·5	—	135	106·6	—	—	57·9	57·2	53·0	29·1	10·8	2·1	24·0	9·0	
09·0	101·7	93·1	123	116	109	348	35·3	28·5	66·3	130	95·0	92·0	—	53·5	54·0	51·6	24·0	9·0	3·2	21·0	7·3	
12·8	110·8	98·3	131	126	112	369	35·9	28·0	66·5	133	96·1	94·2	18·0	53·1	54·0	49·3	27·0	9·0	3·9	21·0	8·5	
04·0	105·0	90·2	120	120	103	343	36·6	28·0	71·5	132	93·2	90·0	22·9	52·8	53·1	48·0	24·0	8·0	1·9	23·5	6·4	
17·0	116·6	95·1	133·5	129·5	109	372	35·3	28·0	68·2	131	102·0	95·0	15·0	56·0	57·8	52·9	31·0	11·0	2·3	25·5	10·7	
15·0	110·6	100·3	130	125	114	369	36·0	30·6	75·8	143	92·0	97·2	17·5	58·6	58·6	57·0	27·1	10·8	4·1	24·0	9·6	
10·0	109·0	102·0	124·5	124	117	365·5	35·4	29·0	72·0	133	100·2	95·0	19·2	54·6	55·7	52·2	24·9	7·8	3·2	17·2	8·3	
24·0	114·0	101·7	142	130	116	388	35·1	29·5	71·0	135	108·6	96·3	17·5	54·1	54·8	53·0	28·2	9·0	2·0	24·0	9·1	
13·5	108·0	87·5	130	123	98	351	36·0	30·0	71·0	140	105·2	96·2	18·5	53·9	54·4	52·0	25·2	10·0	2·8	22·8	9·3	
07·0	105·5	103·0	118·5	116·5	117	352	33·0	29·0	65·1	136	101·3	96·1	15·8	52·1	51·7	48·6	27·0	10·4	2·8	24·0	8·1	
13·8	104·4	95·0	130·5	124	104·5	359	31·5	27·0	74·1	128	96·7	92·0	17·0	56·0	56·0	55·5	25·0	11·2	4·0	20·7	7·6	
12·0	115·1	100·0	127	128	118	375	37·5	28·3	74·9	140	104·0	105·5	20·1	53·8	54·5	54·2	28·0	10·9	3·0	24·3	8·2	
13·8	104·0	93·0	132	122	109	363	32·0	28·7	60·0	134	103·0	90·5	—	49·5	49·8	44·8	28·6	8·4	2·6	19·8	6·3	
09·6	119·0	89·0	124	137	106	367	36·5	25·0	70·2	134	103·0	95·0	17·3	56·0	55·5	52·5	26·4	6·4	3·3	20·9	7·0	

TABELLE XXVII. *Schädelmasse, Java—Männer (Fortsetzung).*

NB	*SC*	*SS*	*DC*	*DS*	*DA*	O_1R	$O_1'R$	*Lacr.* O_1R	O_2R	O_1L	$O_1'L$	*Lacr.* O_1L	O_2L	G_1	G_1'	G_2	*EH*	$P\angle$	*Pros.* $P\angle$	$100\frac{B}{L}$	$100\frac{H'}{L}$	$100\frac{B}{H}$
29·2	7·0	1·7	20·0	8·0	27·0	41·1	38·1	37·0	31·9	40·3	37·0	35·9	31·8	45·3	43·0	39·1	9·2	85°·5	82°·8	83·3	78·2	106·6
24·5	11·6	2·9	24·4	9·6	31·5	42·0	37·3	—	35·6	41·0	37·0	—	34·1	50·4	48·5	35·4	13·4	—	80°·0	94·9	82·8	114·5
26·5	8·2	2·8	21·0	8·3	28·3	43·4	39·8	39·8	33·8	42·0	39·0	—	34·7	53·8	51·4	41·2	13·2	84°·9	83°·0	76·1	74·7	101·9
26·3	8·6	3·7	—	—	—	41·0	—	—	30·2	39·2	—	—	30·7	48·2	44·1	39·7	8·5	82°·0	80°·5	81·9	77·1	106·3
24·8	9·5	3·3	19·3	10·4	30·0	42·6	40·6	39·4	33·4	42·6	39·9	39·0	32·5	48·0	44·8	40·3	13·2	84°·5	83°·0	83·5	83·5	100·0
26·7	8·5	2·0	18·0	8·2	26·0	43·4	—	—	36·4	42·8	39·5	—	36·5	53·9	50·0	—	—	—	68°·7	84·7	80·9	104·7
26·9	5·9	2·0?	17·0	7·4	23·0	40·7	38·2	36·8	31·1	39·1	36·6	35·3	32·1	54·0	49·7	44·9	14·6	82°·4	81°·1	87·9	85·4	103·0
25·0	8·2	1·9	21·6	8·8	27·6	41·2	37·8	37·8	31·8	40·8	37·0	—	31·1	48·0	44·0	37·5	9·4	88°·2	87°·0	78·8	79·7	98·9
27·0	8·3	3·5	21·0	9·0	29·0	40·0	37·0	35·8	30·0	39·0	36·0	35·0	30·2	—	—	—	—	—	—	82·1	80·3	102·3
26·3	10·0	4·0	20·0	13·0	34·0	39·9	37·8	36·2	32·7	39·9	37·2	36·2	32·9	53·0	49·0	38·0	12·0	82°·0	80°·4	75·7	74·4	101·8
26·1	7·0	2·0	19·0	9·5	27·5	39·6	38·0	36·4	32·2	38·7	37·0	35·6	31·3	44·2	41·0	—	—	—	—	77·0	80·4	95·9
26·0	13·0	3·0	24·0	9·0	31·0	43·9	39·8	38·0	33·9	42·8	39·0	37·8	34·8	52·8	47·0	40·3	15·8	87°·1	85°·0	84·1	80·7	104·2
23·7	11·0	3·3	22·0	11·2	34·0	45·5	—	—	35·8	43·0	39·8	—	36·2	49·0	45·5	43·4	13·1	—	79°·0	81·2	76·5	106·1
23·5	9·5	3·0	20·0	8·8	26·0	43·7	40·6	39·7	33·7	41·4	40·0	38·2	34·0	47·8	42·6	—	—	82°·7	80°·5	84·9	80·7	105·1
—	7·2	4·1	19·0	8·2	26·5	39·9	—	—	34·3	38·2	—	34·9	35·5	47·5	43·4	39·6	12·8	84°·7	82°·2	83·5	76·9	108·6
24·9	6·4	3·0?	19·3	7·1	—	43·4	41·1	39·9	38·0	43·7	40·0	39·0	39·0	50·8	47·7	41·6	—	90°·2	89°·6	79·2	74·0	107·0
26·9	8·4	3·2	19·0	7·9	27·0	45·1	41·9	40·0	34·2	43·7	40·0	40·0	35·0	48·2	46·6	—	—	84°·6	83°·9	83·6	82·2	101·8
25·0	10·5	3·1	23·8	11·0	34·0	43·5	37·0	35·0	42·8	37·0	37·0	37·0	34·0	54·2	47·5	38·0	13·0	81°·4	—	78·7	77·8	101·1
24·4	10·3	4·3	21·6	8·0	29·0	41·0	38·0	37·2	32·4	39·7	37·2	36·5	33·3	51·2	44·8	39·0	12·3	84°·7	82°·0	86·2	78·7	109·5
26·0	9·2	2·2	22·0	7·3	28·0	41·1	39·0	38·0	33·2	39·0	37·0	36·4	33·5	47·0	45·4	38·0	12·5	78°·3	76°·3	85·5	82·4	103·7
28·7	8·3	3·2	21·3	9·4	29·0	44·8	39·9	39·9	34·0	43·6	39·0	39·0	34·6	51·2	47·7	41·8	15·0	77°·5	76°·8	80·7	77·5	104·1
26·2	13·0	1·7	27·0	8·6	34·0	45·0	39·0	39·0	31·7	43·8	38·2	37·2	33·5	50·4	45·2	—	—	83°·0	81°·0	79·8	75·5	105·7
26·1	9·2	3·0	23·0	8·7	30·5	42·5	38·9	38·9	34·0	43·5	39·1	38·7	33·4	57·0	51·0	46·2	11·7	73°·0	71°·0	85·2	82·4	103·3
27·9	10·0	3·4	21·6	9·8	29·0	39·2	37·2	37·0	32·1	39·2	—	—	31·5	50·8	46·6	—	—	83°·0	82°·8	79·8	74·0	107·8
26·9	11·0	2·9	23·0	9·5	31·0	44·0	39·0	38·6	32·8	42·0	38·8	38·0	32·1	51·2	45·8	41·4	12·2	80°·0	77°·8	81·3	77·8	104·4
24·1	8·0	2·0	20·0	9·4	29·3	44·9	41·0	39·2	34·0	43·0	39·8	38·0	34·5	54·6	49·3	39·5	14·5	81°·6	81°·3	84·5	86·7	97·6
25·6	6·2	1·3	21·3	8·1	28·0	42·0	39·0	39·0	33·0	42·0	—	39·0	32·5	49·7	43·6	41·0	10·8	87°·1	85°·5	93·5	86·0	108·6
27·0	9·0	2·2	23·0	5·9	28·0	42·2	38·5	38·5	34·0	40·5	—	36·9	35·0	55·3	50·2	40·6	9·8	81°·9	79°·4	86·1	76·4	110·2
26·6	10·0	2·5	22·0	8·8	29·5	43·3	40·0	39·0	37·0	43·3	39·7	39·0	37·8	51·0	45·6	43·0	11·8	81°·1	80°·2	83·2	76·4	109·0
28·0	4·6	1·2	22·0	6·5	27·4	44·0	39·0	—	31·0	43·5	38·5	—	30·5	50·4	47·0	39·0	12·0	75°·5	73°·5	84·9	82·2	103·3
26·4	8·2	3·7	21·0	9·8	31·0	41·6	38·4	38·4	34·2	41·0	37·0	37·0	34·7	51·8	47·0	37·0	14·0	80°·5	78°·1	79·8	75·7	105·3
25·5	8·0	3·9	23·0	9·5	29·0	42·3	37·9	37·9	33·6	43·0	38·9	—	33·0	54·2	47·1	42·3	12·0	82°·9	82°·0	81·7	77·3	105·7
27·8	14·0	2·9	24·3	7·8	29·5	40·3	38·7	37·5	30·6	39·2	36·6	35·8	32·0	—	—	41·9	12·0	82°·0	80°·3	80·7	77·2	104·5
26·9	5·0	3·0?	19·0	10·0	28·0	41·8	37·5	36·7	34·1	41·7	38·2	37·8	33·2	51·7	44·9	42·5	12·3	80°·6	79°·7	87·0	82·9	105·0
26·5	7·0	2·1	17·0	8·4	27·0	39·2	35·6	35·3	33·1	39·0	36·1	35·0	34·3	46·0	43·8	33·0	10·8	87°·0	86°·4	87·5	82·1	106·6
24·5	8·6	1·9	21·0	7·5	27·6	43·0	40·0	38·3	34·0	41·6	39·0	37·5	33·0	52·4	48·0	42·2	—	81°·8	81°·0	80·6	81·5	98·9
25·8	6·4	1·5	19·8	6·8	26·0	41·6	38·0	38·0	34·0	40·6	37·5	—	34·0	45·1	42·8	38·1	—	—	83°·0	86·0	80·1	107·4
24·8	9·8	3·8	21·3	8·2	28·0	44·0	41·0	39·8	34·1	43·2	38·9	38·3	33·4	49·0	44·2	45·5	11·0	85°·0	84°·5	91·9	80·5	114·1
26·8	7·2	2·8	22·0	9·0	30·0	42·1	39·7	38·5	35·9	41·7	38·2	37·8	36·3	53·6	48·5	42·0	13·8	81°·8	80°·9	86·4	77·7	111·2
26·9	7·3	3·8	22·3	9·8	31·0	45·5	—	40·0	33·8	44·2	—	40·3	34·0	51·8	45·1	39·0	12·1	86°·2	84°·1	81·3	79·0	102·9
25·9	8·0	3·0	21·8	9·0	29·0	42·0	40·1	39·1	33·8	41·7	37·8	37·8	33·4	49·7	46·4	39·0	11·0	81°·0	79°·1	78·2	74·9	104·5
29·2	6·0	1·0	20·0	7·2	26·0	44·6	42·1	40·1	34·0	42·4	40·7	39·0	34·8	44·8	42·6	39·1	—	83°·9	82°·7	80·3	76·9	104·4
25·5	7·4	2·6	—	—	—	41·0	—	—	33·3	40·2	—	—	33·5	43·0?	40·2	37·9	13·3	89°·8	88°·8	76·8	79·2	97·0
27·3	11·0	3·7	21·0	8·8	27·0	47·0	44·8	42·3	35·0	46·0	42·9	41·2	36·0	—	—	—	—	82°·0	80°·0	78·9	79·2	99·6
25·4	—	—	—	—	—	43·6	—	38·0	36·4	43·4	40·0	38·5	36·3	—	—	—	—	91°·3	89°·5	—	80·2	—
27·5	10·0	2·8	20·0	8·6	28·0	42·0	39·0	39·0	32·3	42·3	39·3	39·0	33·0	54·7	49·8	—	—	—	—	88·8	80·6	110·1
27·8	8·0	3·2	24·4	9·6	31·5	43·9	40·3	40·3	33·4	42·9	39·5	—	34·2	47·4	46·0	46·0	12·0	84°·5	80°·0	78·0	79·7	97·8
25·3	7·5	1·8	20·3	7·0	26·0	44·0	40·0	40·0	35·5	42·5	39·0	39·0	37·0	55·7	50·8	—	—	79°·9	78°·0	80·2	80·2	100·0
27·0	9·3	2·9	19·0	8·4	26·5	42·7	41·0	39·9	32·2	42·0	39·8	38·1	31·9	54·0	50·0	43·5	9·8	82°·5	81°·0	78·9	80·0	98·6
25·6	9·0	4·1	23·0	10·5	30·0	44·0	—	39·0	32·0	42·4	—	37·4	32·0	51·0	45·5	39·6	8·9	81°·5	80°·0	78·8	74·8	105·4
30·0	6·7	3·0	21·8	8·9	28·5	45·0	40·0	40·0	34·6	43·0	38·1	38·1	35·0	52·0	47·3	42·2	10·1	85°·0	82°·6	84·8	75·2	112·8
27·0	5·2	2·0	19·0	7·2	25·0	43·0	40·2	38·9	34·3	40·9	38·0	36·9	34·1	52·9	48·6	37·2	12·3	79°·9	78°·7	85·8	74·1	115·9
23·4	6·0	2·8	—	—	—	45·4	—	—	32·2	45·0	—	—	32·3	50·0	45·0	36·0	12·4	—	79°·2	89·3	86·5	103·3
26·0	—	—	19·6	6·9	30·0	42·1	37·9	37·9	35·8	42·1	36·7	—	35·8	50·8	46·5	45·5	12·3	—	81°·2	89·1	76·5	116·5
26·9	10·2	2·6	23·0	9·0	30·0	42·3	39·2	—	33·9	42·2	38·2	—	33·5	52·9	48·0	36·2	13·3	84°·9	82°·8	80·4	79·2	101·5
26·0	—	—	—	—	—	42·3	38·6	38·0	32·0	41·0	38·2	37·0	31·0	44·0	42·0	38·5	15·2	—	—	84·9	80·1	106·0
29·1	10·8	2·1	24·0	9·0	32·5	42·9	—	39·0	36·0	42·1	—	38·6	36·6	—	—	—	—	88°·6	86°·8	85·8	78·1	109·8
24·0	9·0	3·2	21·0	7·3	29·0	41·1	39·0	38·0	32·6	41·8	39·0	36·9	33·7	45·6	44·0	43·6	12·4	82°·8	79°·8	85·7	82·0	104·5
27·0	9·0	3·9	21·0	8·5	29·0	41·1	38·2	37·0	32·0	40·3	38·2	37·0	32·9	47·5	45·1	42·9	13·5	84°·9	83°·1	84·4	79·8	105·6
24·0	8·0	1·9	23·5	6·4	27·0	40·9	—	36·7	30·0	40·0	—	35·3	31·0	49·0	44·0	36·6	10·1	84°·2	83°·8	86·4	76·3	113·2
31·0	11·0	2·3	25·5	10·7	35·5	41·9	—	38·1	31·7	42·2	—	37·9	32·0	43·0	41·2	45·8	9·2	91°·0	87°·8	79·3	80·4	98·6
27·1	10·8	4·1	24·0	9·6	33·0	42·0	39·0	37·8	33·0	42·4	39·0	38·1	34·1	—	—	41·9	11·2	93°·1	91°·9	81·3	80·7	100·7
24·9	7·8	3·2	17·2	8·3	26·0	42·0	39·0	39·0	34·4	42·0	39·0	—	34·9	50·0	46·0	44·3	15·2	81°·9	78°·0	77·7	78·2	99·3
28·2	9·0	2·0	24·0	9·1	33·0	41·5	—	38·0	35·2	41·1	38·0	38·0	34·5	52·1	48·3	39·0	12·8	83°·0	82°·9	82·8	78·9	104·9
25·2	10·0	2·8	22·8	9·3	30·0	41·6	40·0	39·0	33·2	41·0	—	38·6	33·8	49·8	46·7	47·6	16·2	88°·4	86°·0	87·5	82·4	106·1
27·0	10·4	2·8	24 0	8·1	31·0	41·2	—	38·4	29·5	41·2	38·4	37·2	30·6	—	—	36·7	9·8	80°·0	76°·1	80·3	76·0	105·7
25·0	11·2	4·0	20·7	7·6	27·0	42·2	40·3	38·5	35·0	42·2	39·8	38·7	35·0	47·0	42·5	41·4	12·0	83°·9	82°·6	86·7	80·7	107·3
28·0	10·9	3·0	24·3	8·2	31·0	43·1	—	39·0	35·2	44·2	40·3	39·5	35·0	52·0	47·5	41·6	11·0	83°·0	81°·3	79·0	77·6	101·8
28·6	8·4	2·6	19·8	6·3	25·5	44·6	42·5	40·4	31·5	42·5	40·0	39·2	31·5	46·5	43·1	44·3	10·0	85°·0	81°·4	85·6	78·1	109·6
26·4	6·4	3·3	20·9	7·0	27·0	45·0	42·0	40·0	33·9	45·0	42·4	40·9	33·5	48·5	46·0	40·5	11·8	—	—	80·1	77·8	102·9

$100\frac{H'}{L}$	$100\frac{B}{H'}$	$100\frac{B-H'}{L}$	*Oc. I.*	$100\frac{G'H}{GB}$	$100\frac{NB}{NHR}$	$100\frac{NB}{NH'}$	$100\frac{DS}{DC}$	$100\frac{SS}{SC}$	$100\frac{O_2}{O_1R}$	$100\frac{O_2}{Lacr.\ O_1R}$	$100\frac{O_2}{O_1L}$	$100\frac{G_2}{G_1}$	$100\frac{G_2}{G_1'}$	$100\frac{f}{f}$
78·2	106·6	5·2	65·4	64·1	61·6	64·7	40·0	24·3	77·6	86·2	78·9	86·3	90·9	75·
82·8	114·5	12·1	70·7	74·1	50·8	55·9	39·3	25·0	84·8	—	83·2	70·1	73·0	85·
74·7	101·9	1·4	58·8	74·5	49·3	52·6	39·5	34·1	77·9	84·9	82·6	76·6	80·2	87·
77·1	106·3	4·8	63·0	61·8	53·8	55·6	—	43·0	73·7	—	78·3	82·4	90·0	83·
83·5	100·0	0·0	85·4	72·4	45·8	45·8	53·9	34·7	78·4	84·8	76·3	84·0	90·0	82·
80·9	104·7	3·8	65·7	70·8	55·3	57·8	45·6	23·5	84·1	—	85·3	—	—	82·
85·4	103·0	2·5	79·9	76·1	50·4	52·3	43·5	33·9?	76·4	84·5	82·1	83·1	90·3	76·
79·7	98·9	−0·9	58·5	67·4	49·0	53·1	41·9	23·2	77·2	84·1	76·2	78·1	85·2	91·
80·3	102·3	1·9	70·2	—	51·9	58·1	42·9	42·2	75·0	83·8	77·4	—	—	89·
74·4	101·8	1·4	60·5	71·9	49·5	54·1	65·0	40·0	82·0	90·3	82·5	71·7	77·6	77·
80·4	95·9	−3·3	64·9	—	55·3	56·6	50·0	28·6	81·3	88·5	80·9	—	—	72·
80·7	104·2	3·4	65·1	75·8	45·9	50·0	37·5	23·1	77·2	89·2	81·3	76·3	85·7	77·
76·5	106·1	4·6	68·9	65·0	42·4	43·2	50·9	30·0	78·7	—	84·2	88·6	95·4	74·
80·7	105·1	4·2	70·0	66·0	45·2	49·7	44·0	31·6	77·1	84·9	82·1	—	—	85·
76·9	108·6	6·6	61·0	74·9	—	—	43·2	56·9	86·0	—	92·9	83·4	91·2	82·
74·0	107·0	5·2	60·2	—	45·0	45·7	36·8	46·9?	87·6	95·2	89·2	81·9	87·2	89·
82·2	101·8	0·9	65·7	65·6	49·5	52·5	41·6	38·1	75·8	85·5	80·1	—	—	87·
77·8	101·1	0·9	57·7	74·4	51·2	55·3	46·2	29·5	80·5	94·6	79·4	70·0	80·0	73·
78·7	109·5	7·5	64·6	75·1	48·7	50·9	37·0	41·7	79·0	87·1	83·9	76·2	87·1	80·
82·4	103·7	3·0	71·7	67·7	54·7	56·0	33·2	23·9	80·8	87·4	85·9	80·9	83·7	78·
77·5	104·1	3·2	66·1	70·6	54·0	56·4	44·1	38·6	75·9	85·2	79·4	81·7	87·6	79·
75·5	105·7	4·3	61·1	71·0	51·9	53·3	31·9	13·1	70·4	81·3	76·5	—	—	89·
82·4	103·3	2·7	72·2	72·4	49·4	51·6?	37·8	32·6	80·0	87·4	76·8	81·1	90·6	83·
74·0	107·8	5·8	63·3	—	55·1	56·6	45·3	34·0	81·9	86·8	80·4	—	—	78·
77·8	104·4	3·4	61·0	73·1	—	—	41·3	26·4	74·5	85·0	76·4	80·9	90·4	76·
86·7	97·6	−2·1	69·6	74·1	46·3	45·1	47·0	26·3	75·9	86·7	80·2	72·3	80·1	93·
86·0	108·6	7·4	73·9	72·9	50·2	55·7	48·0	21·0	78·6	84·6	77·4	82·5	94·0	79·
76·4	110·2	7·8	59·5	70·9	54·5	55·6	25·7	24·4	80·6	88·3	86·4	73·4	80·9	93·
76·4	109·0	6·9	64·9	71·9	47·9	50·0	40·0	25·0	85·5	94·9	87·3	84·3	94·3	73·
82·2	103·3	2·7	70·7	68·7	59·6	63·6	29·6	26·1	70·5	—	70·1	77·4	83·0	89·
75·7	105·3	4·0	62·7	77·3	51·8	53·7	46·7	45·1	82·2	89·1	84·6	71·4	78·7	89·
77·3	105·7	4·4	72·7	78·8	47·8	48·2	41·3	48·8	79·4	88·7	76·7	78·0	89·8	80·
77·2	104·5	3·5	62·1	69·0	54·4	55·6	32·1	20·7	75·9	81·6	81·6	—	—	83·
82·9	105·0	4·1	74·2	66·3	52·5	54·7	52·6	60·0?	81·6	92·9	79·6	82·4	94·7	83·
82·1	106·6	5·4	72·0	84·9	47·7	49·1	49·4	30·0	84·4	93·8	87·9	71·7	75·3	82·
81·5	98·9	−0·9	67·8	73·3	49·0	51·9	35·7	22·1	79·1	88·8	79·3	80·5	87·9	82·
80·1	107·4	5·9	65·7	64·0	55·0	57·8	34·3	23·4	81·7	89·5	83·7	84·5	89·0	80·
80·5	114·1	11·3	63·3	68·1	48·6	51·7	38·5	38·8	77·5	85·7	77·3	92·9	102·9	85·
77·7	111·2	8·7	68·7	72·5	48·2	48·4	40·9	38·9	85·3	93·2	87·1	78·4	86·6	78·
79·0	102·9	2·3	59·4	72·4	51·8	56·2	43·9	52·1	74·3	84·5	76·9	75·3	86·5	74·
74·9	104·5	3·4	58·4	67·0	51·8	54·5	41·3	37·5	80·5	86·4	80·1	78·5	84·1	88·
76·9	104·4	3·4	73·7	61·5	58·9	65·9	36·0	16·7	76·2	84·8	82·1	87·3	91·8	76·
79·2	97·0	−2·3	65·8	69·5	50·7	51·9	—	35·1	81·2	—	83·3	88·1?	94·3	79·
79·2	99·6	−0·3	60·7	69·0	51·5	53·5	41·9	33·6	74·5	82·7	78·3	—	—	83·
80·2	—	—	66·7	—	47·0	52·4	—	—	83·5	95·8	83·6	—	—	88·
80·6	110·1	8·1	69·1	70·7	54·6	55·9	43·0	28·0	76·9	82·8	78·0	—	—	72·
79·7	97·8	−1·7	64·4	62·9	55·3	58·5	39·3	40·0	76·1	82·9	79·7	97·0	100·0	72·
80·2	100·0	0·0	61·6	71·2	48·2	51·6	34·5	24·0	80·7	88·8	87·1	—	—	83·
80·0	98·6	−1·1	68·7	74·5	51·8	52·0	44·2	31·2	75·4	80·7	76·0	80·6	87·0	83·
74·8	105·4	4·1	58·0	63·8	52·8	53·3	45·7	45·6	72·7	82·1	75·5	77·6	87·0	78·
75·2	112·8	9·6	68·4	70·4	50·0	51·7	40·8	44·8	76·9	86·5	81·4	81·2	89·2	79·
74·1	115·9	11·7	64·4	—	52·9	54·1	37·9	38·5	79·8	88·2	83·4	—	76·5	85·
86·5	103·3	2·8	68·4	75·4	47·8	50·6	—	46·7	70·9	—	71·8	78·0	80·0	86·
76·5	116·5	12·6	66·7	78·4	47·3	50·0	35·2	—	85·0	94·5	85·0	84·6	92·5	77·
79·2	101·5	1·2	—	73·1	50·6	54·9	39·1	25·5	80·1	—	79·4	68·4	75·4	87·
80·1	106·0	4·9	68·7	73·0	—	49·5	—	—	75·7	84·2	75·6	87·5	91·7	—
78·1	109·8	7·7	62·4	—	50·3	54·9	37·5	19·4	83·9	92·3	86·9	—	—	81·
82·0	104·5	3·7	62·6	69·8	44·9	46·5	34·8	35·6	79·3	85·8	80·6	95·6	99·1	80·
79·8	105·6	4·6	66·6	69·2	50·8	54·8	40·5	43·3	77·9	86·5	81·6	90·3	95·1	78·
76·3	113·2	10·1	66·1	76·7	45·5	50·0	27·2	23·8	73·3	81·7	77·5	74·7	83·2	76·
80·4	98·6	−1·1	65·5	66·9	55·4	58·6	42·0	20·9	75·7	83·2	75·8	106·7	111·2	79·
80·7	100·7	0·6	66·9	82·4	46·2	47·5	40·0	38·0	78·6	87·3	80·4	—	—	85·
78·2	99·3	−0·6	65·4	71·9	45·5	47·7	48·3	41·0	81·9	88·2	83·1	88·6	96·3	81·
78·9	104·9	3·9	66·3	65·4	52·1	53·2	—	—	84·8	92·6	—	74·9	—	84·
82·4	100·1	5·1	69·8	67·5	46·8	48·5	40·8	28·0	79·8	85·1	82·4	95·6	101·9	83·
76·0	105·7	4·3	67·0	64·3	51·8	55·6	33·8	26·9	71·6	76·8	74·3	—	—	87·
80·7	107·3	5·9	74·5	85·5	44·6	45·0	—	—	82·9	90·9	—	88·1	—	85·
77·6	101·8	1·4	61·7	72·0	52·0	51·7	33·7	27·5	81·7	90·3	79·2	80·0	87·6	75·
78·1	109·6	7·5	62·4	58·3	57·8	63·8	31·8	31·0	70·6	78·0	74·1	95·5	102·8	89·
77·8	102·9	2·3	60·7	68·2	47·1	50·3	33·5	51·6	75·3	84·8	74·4	83·5	88·0	68·

$100\frac{fmb}{fml}$	$B\angle$	$A\angle$	$N\angle$	$100\frac{EH}{G_2}$	Aufschriften der Schädel
75·6	39°·9	72°·5	67°·6	23·5	Narim, natus Bantam, Batavia, Swaving.
85·2	43°·2	66°·9	69°·9	37·9	Kasnirin, natus Bantam, Batavia, 20. v. '62, Swaving.
87·4	40°·6	70°·9	68°·5	32·0	Djakiem, Bantam, Batavia, 1862, Swaving.
83·3	38°·1	72°·8	69°·1	21·4	Alie, alias Naksa, natus Bantam, Batavia, Swaving.
82·9	40°·9	74°·7	64°·4	32·8	Bardan, natus Bantam, Batavia, 1866, Swaving.
82·7?	40°·3	64°·5	75°·2	—	Kapidien, natus Bantam, Batavia, 31. i. '62, Swaving.
76·3	43°·4	65°·8	70°·8	32·5	Tjeninga, natus Bantam, Batavia, 10. vii. '67, Swaving.
91·2	42°·0	75°·0	63°·0	25·1	Mikrat, natus Bantam, Batavia, 12. vii. '67, Swaving.
89·0	—	—	—	—	Ketjoel, natus Serang, Batavia, 29. viii. '67, Swaving.
77·6?	40°·6	72°·0	67°·4	31·6	Djawani, natus Bantam, Batavia, 7. ix. '67, Swaving.
72·0	—	—	—	—	Mochidien, natus Bantam, Batavia, 15. x. '60, Swaving.
77·0	43°·7	72°·0	64°·3	39·2	Aita, maniacus, Bantam, Batavia, 1860, Swaving.
74·6	42°·2	71°·4	66°·4	30·2	Armoein, natus Bantam, Batavia, 23. ix. '60, Swaving.
85·8	39°·2	74°·4	66°·4	—	Doela, maniacus, natus Bantam, Batavia, 10. xi. '60, Swaving.
82·4	42°·9	69°·7	67°·4	32·3	Kasiem, maniacus, Bantam, Batavia, 15. x. '60, Swaving.
89·5	49°·1	64°·4	66°·5	—	Mamoet, maniacus, natus Bantam, Batavia, 14. vi. '60, Swaving.
87·8	39°·0	76°·0	65°·0	—	Radie, maniacus, natus Bantam, Batavia, 16. xi. '60, Swaving.
73·9	44°·0	68°·5	67°·5	34·2	Sanguid, maniacus, natus Bantam, Batavia, 29. ix. '60, Swaving.
80·6	43°·2	69°·3	67°·5	31·5	Pada, maniacus, natus Bantam, Batavia, 1860, Swaving.
78·9	38°·4	71°·6	70°·0	32·9	Siepak, maniacus, natus Bantam, Batavia, 1862, Swaving.
79·2	39°·7	67°·3	73°·0	35·9	Mapadar, maniacus, Bantam, Swaving.
89·4	41°·4	72°·4	66°·2	—	
83·3	39°·2	63°·9	76°·9	25·3	Sadjem, natus Batavia, Batavia, 9. i. '67, Swaving.
78·9	—	—	—	—	Templang, natus Batavia, Batavia, 31. i. '67, Swaving.
76·8	43°·5	65°·9	70°·6	29·5	Koto, natus prope Batavia, Batavia, 1. vii. '67, Swaving.
93·7	42°·7	71°·5	65°·8	36·7	
79·7	46°·0	69°·5	64°·5	26·3	Main, natus Batavia, Batavia, 15. iii. '60, Swaving.
93·8	41°·0	63°·3	75°·7	24·1	Alhani, natus Batavia, Batavia, 21. iv. '69, Swaving.
73·8	43°·9	72°·6	63°·5	27·4	
89·7	40°·4	64°·6	75°·0	30·8	——, incola ex insula Engana, Batavia, 6. vii. '69, Swaving.
89·8	43°·9	66°·7	69°·4	37·8	Sahit, malaicus, natus Batavia, Swaving.
80·9	46°·0	65°·2	68°·8	28·4	Magi, natus Batavia, Swaving.
83·6	39°·9	68°·0	72°·1	28·6	Raksa, malaicus, natus prope Batavia, Batavia, 1869, Swaving.
83·3	42°·4	69°·4	68°·2	28·9	Piein, malaicus, natus prope Batavia, Batavia, Swaving.
82·8	48°·2	67°·2	64°·6	32·7	Apiem, natus Buitenzorg Java, Batavia, 10. x. '69, Swaving.
82·3	42°·5	70°·3	67°·2	—	Mamot, natus Meester Cornelis, Batavia, 19. vii. '69, Swaving.
80·3	39°·0	72°·0	69°·0	—	Niroen, maniacus, natus Tangaran, Batavia, 31. xii. '61, Swaving.
85·8	45°·0	72°·5	62°·5	24·2	Djamoen Watti, natus Bekassi, Swaving.
78·8	43°·4	68°·4	68°·2	32·9	Oedaran, maniacus, natus Tangaran, Batavia, 1861, Swaving.
74·9	40°·7	73°·3	66°·0	31·0	Keriedien, maniacus, natus Tangaran, Batavia, 1862, Swaving.
88·0	42°·8	70°·0	67°·2	28·2	——, natus Tangaran, Batavia, Swaving.
76·3	41°·1	70°·0	68°·9	—	Ardain, maniacus, natus Batavia, Meester Cornelis, Batavia, Swaving.
79·2	40°·4	75°·6	64°·0	35·1	Raisan, maniacus, natus Batavia, Batavia, Swaving.
83·6	39°·8	74°·2	66°·0	—	Moerkidjan, maniacus, incola Batavia, Batavia, 1862, Swaving.
88·9	—	—	—	—	Sapa, maniacus, natus Meester Cornelis, Batavia, 1862, Swaving.
72·3	41°·8	65°·1	73°·1	—	
72·4	40°·7	71°·9	67°·4	26·1	Kandang, maniacus, natus Krawang, Batavia, 1860, Swaving.
83·6	40°·5	70°·5	69°·0	—	Javanischer Seeräuber v. d. Verlaten Inseln.
83·1	42°·2	70°·9	66°·9	22·5	Bataijoeda, natus Gheribon Java, Batavia, 31. viii. '67, Swaving.
78·0	40°·1	69°·6	70°·3	22·5	Ikan, malaicus, natus Tjandjoer, Batavia, 1861, Swaving.
79·9	47°·5	65°·5	67°·0	23·9	Alie, alias Rakien, natus Tjandjoer, Batavia, 26. xii. '60, Swaving.
85·1	—	—	—	33·1	Bapa Sariena, natus Tjandjoer, Batavia, 1862, Swaving.
86·3	44°·8	65°·9	69°·3	34·4	Sabien, Batavia, 21. ix. '69, Swaving.
77·7	47°·7	64°·5	67°·8	28·6	Jairan, natus Tjandjoer, Batavia, 13. iv. '70, Swaving.
87·8	43°·1	69°·9	67°·0	36·7	Siein, Preanger Regentschappen, Swaving.
—	42°·8	72°·7	64°·5	39·5	Mahil, natus Probolingo, Batavia, 1867, Swaving.
81·9	—	—	—	—	Moerrap, natus Patjanjan-barat, Batavia, 27. xi. '67, Swaving.
80·7	42°·1	69°·4	68°·5	28·4	Siane, natus Madoera, Batavia, 11. iii. '67, Swaving.
78·0	40°·5	72°·8	66°·7	31·5	Pa Dinian, natus Banger, Madoera, Batavia, 17. iv. '69, Swaving.
76·5	45°·5	70°·5	64°·0	27·6	Pa Sarina, natus Madoera, Batavia, ? vi. '67, Swaving.
79·3	39°·8	77°·1	63°·1	20·1	Ngudjimon Wassidie, insula Madoera, Swaving.
85·0	44°·8	77°·2	58°·0	26·7	Muarjania, natus Madoera, Swaving.
81·9	43°·4	71°·1	65°·5	34·3	Pa Sakieba, natus Boesangan?, Batavia, Swaving.
84·0	43°·7	67°·2	69°·1	32·8	
83·3	41°·9	73°·2	64°·9	34·0	Cr. Madoerensis.
87·9	39°·2	71°·8	69°·0	26·7	Insel, Madoera.
85·7	46°·3	70°·6	63°·1	29·0	Cr. Madoera.
75·5	42°·0	67°·7	70°·3	26·4	Madoera.
89·7	37°·8	74°·2	68°·0	22·6	Madoera.
68·5	42°·0	73°·0	65°·0	29·1	Madoera.

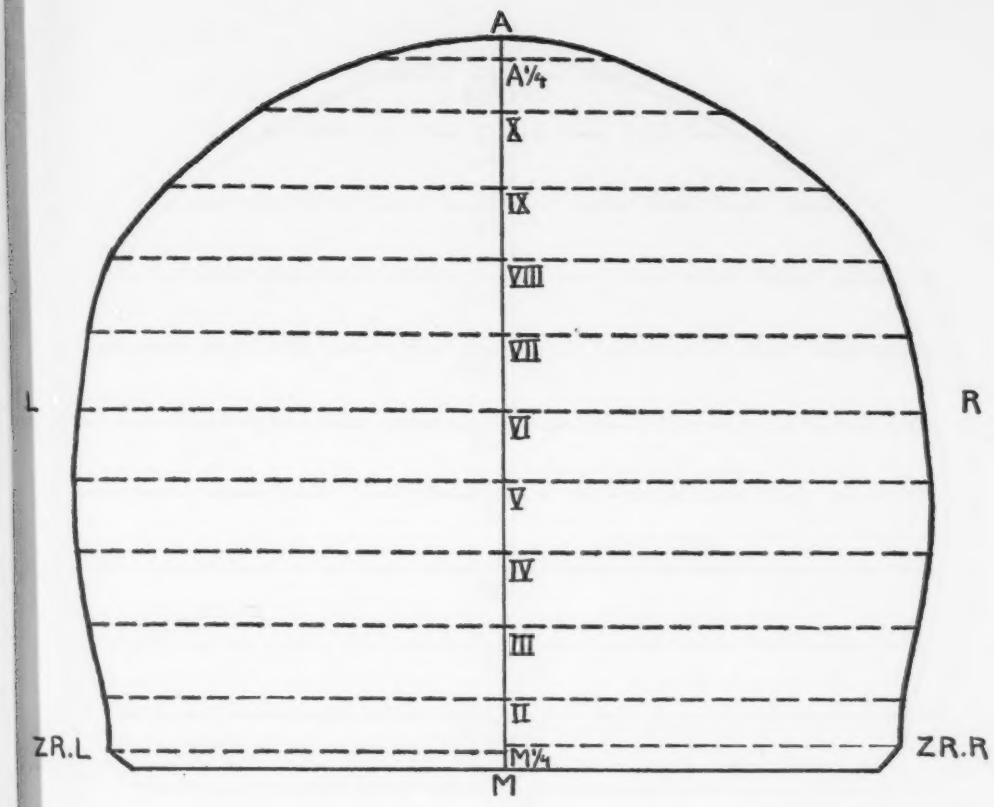


Fig. 2. Dajaks ♂ (30). Transversale Typen Kontur.

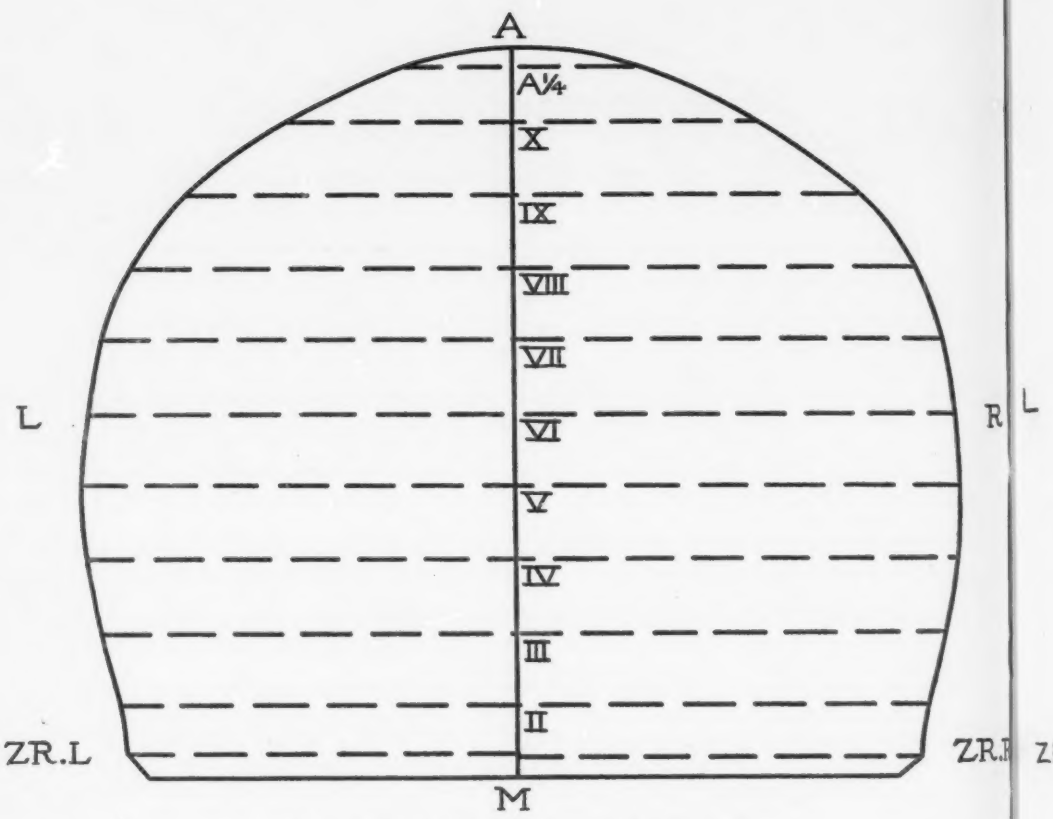


Fig. 3. Bantam-Batavia ♂ (53). Transversale Typen Kontur.

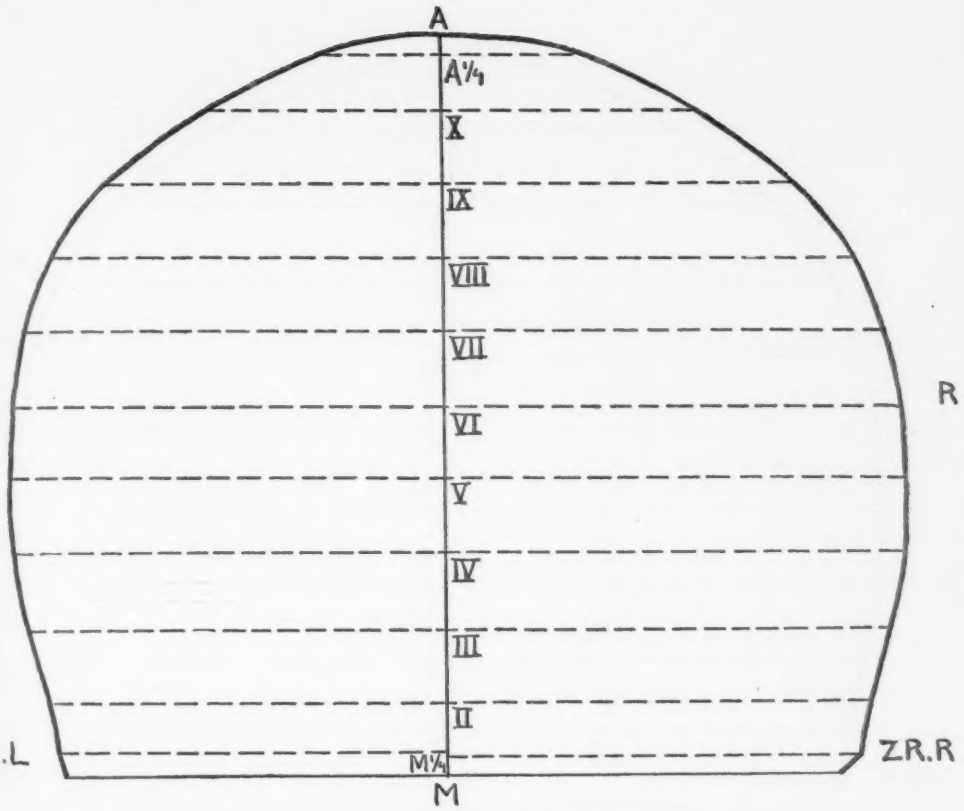


Fig. 4. Mittel-Java ♂ (30). Transversale Typen Kontur.

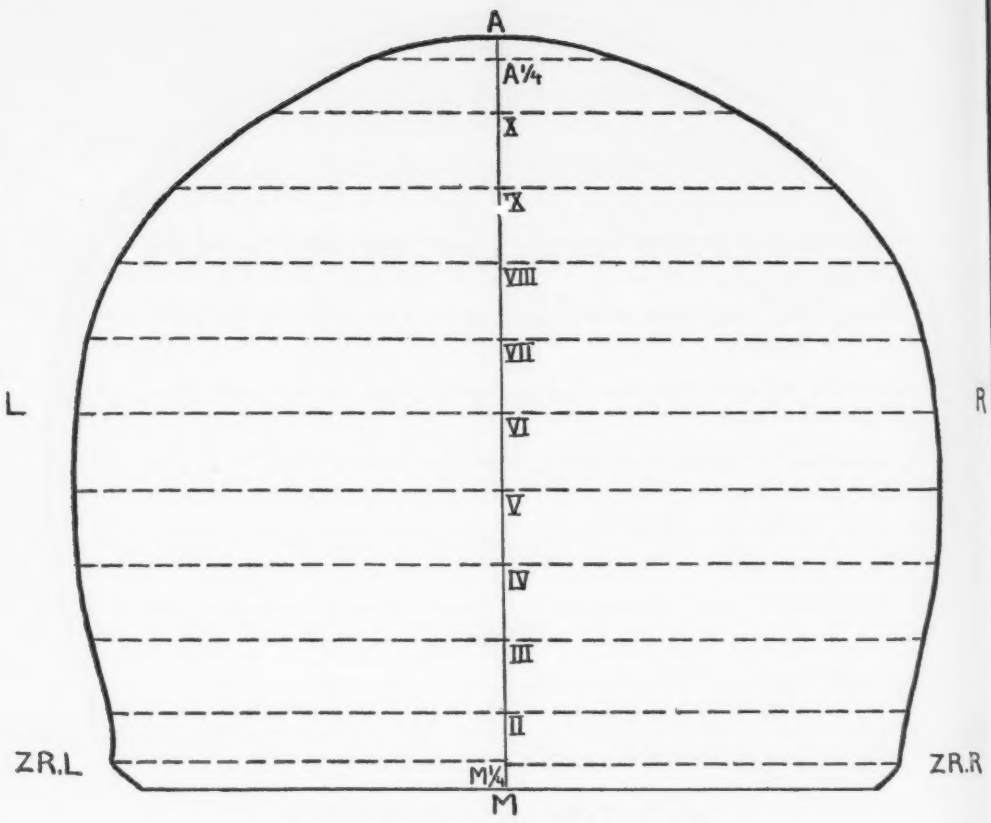


Fig. 5. Tagalen ♂ (29). Transversale Typen Kontur.

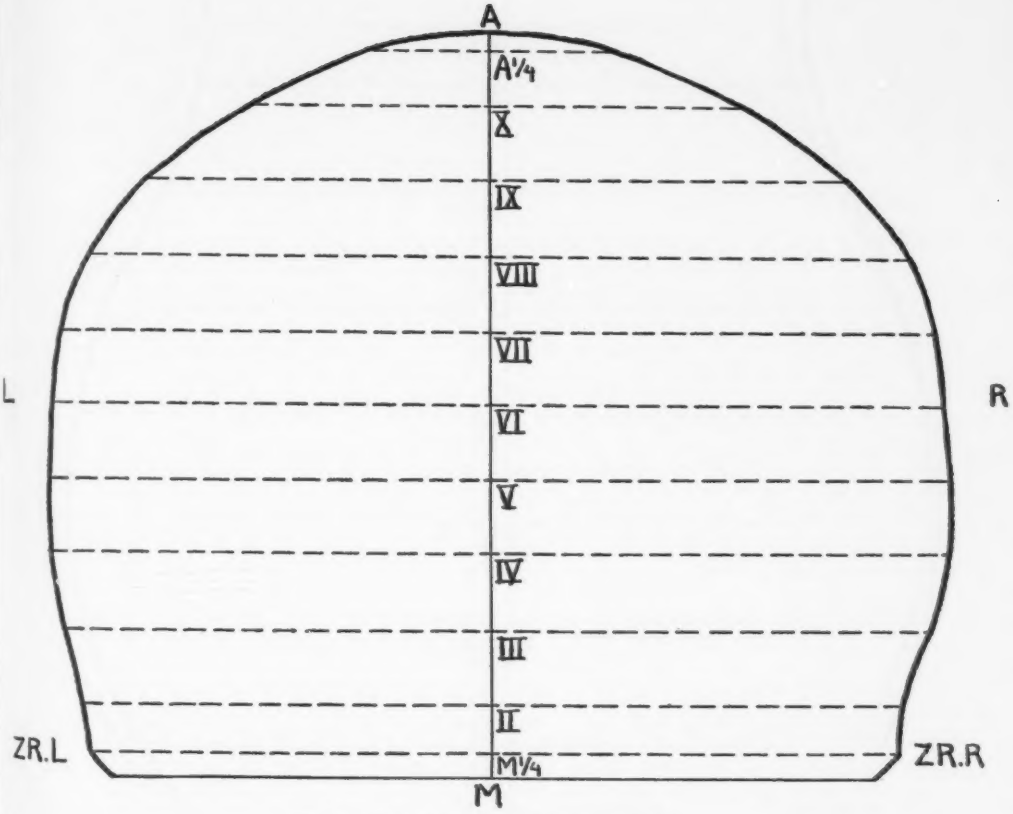


Fig. 6. Aëtas ♂ (30). Transversale Typen Kontur.

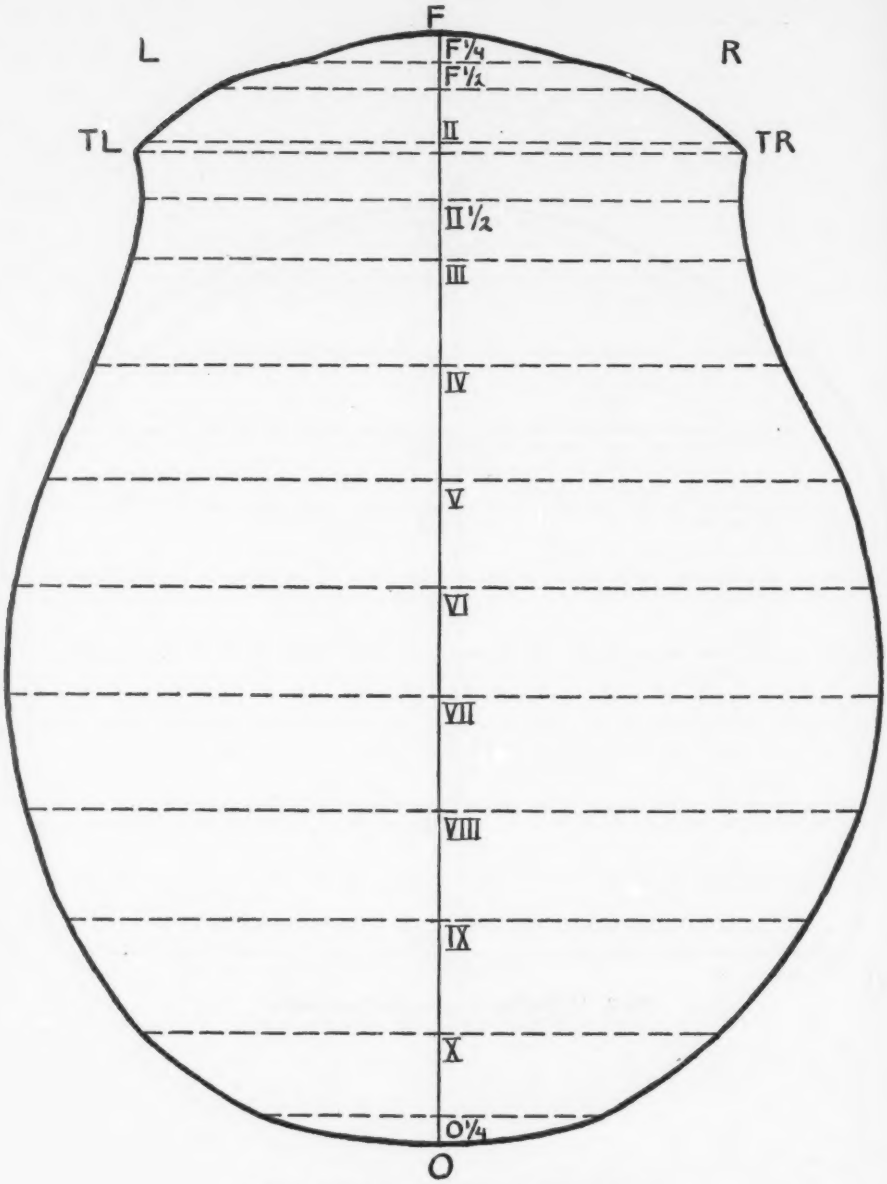


Fig. 7. Dajaks ♂ (30). Horizontale Typen Kontur.

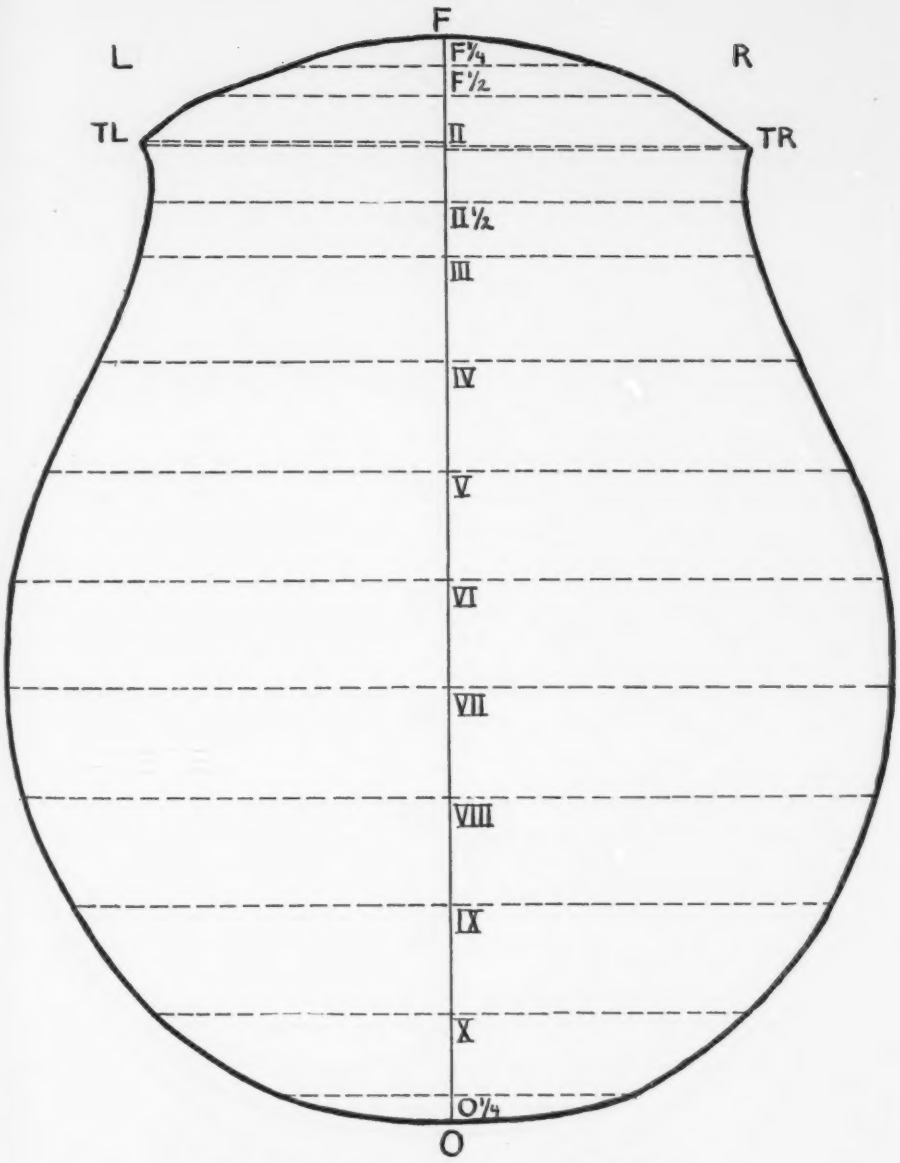


Fig. 8. Bantam-Batavia ♂ (54). Horizontale Typen Kontur.

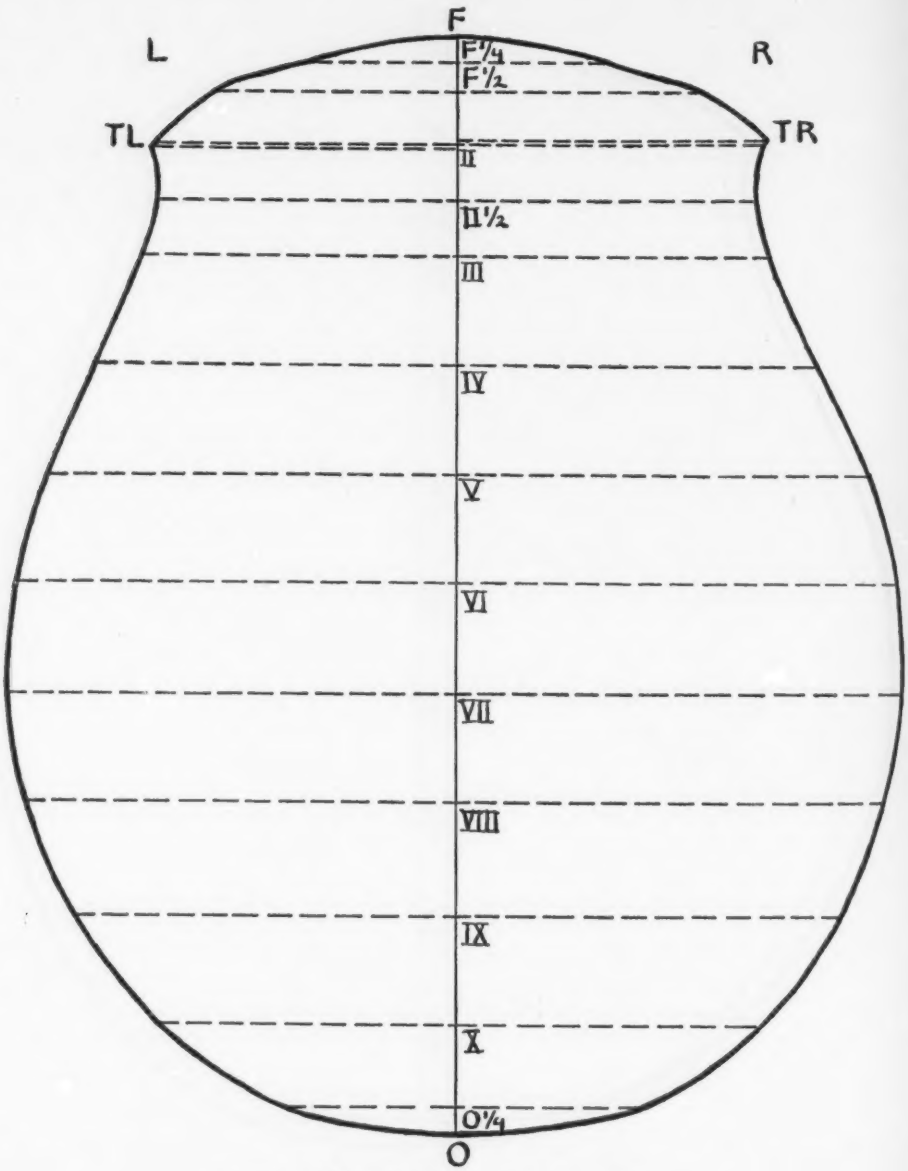


Fig. 9. Mittel-Java ♂ (30). Horizontale Typen Kontur.

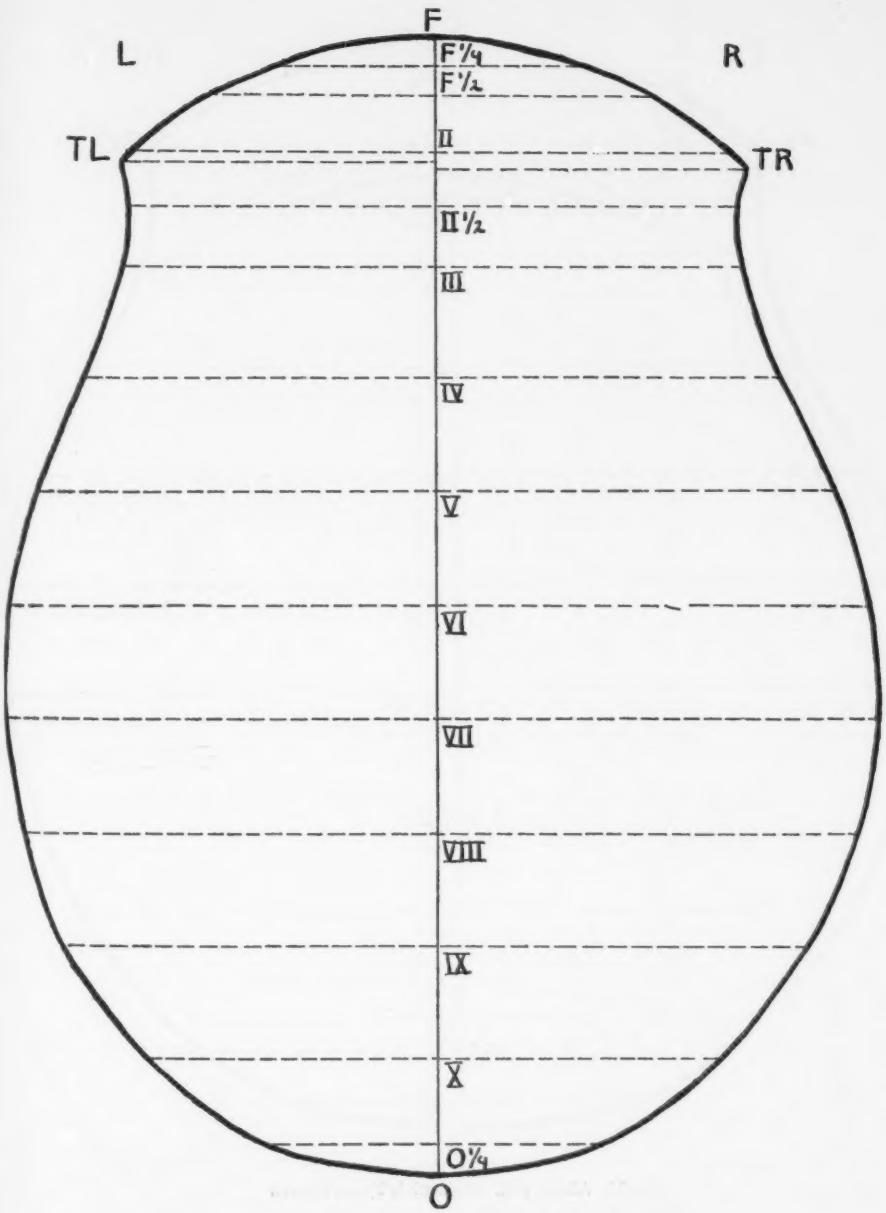


Fig. 10. Tagalen ♂ (29). Horizontale Typen Kontur.

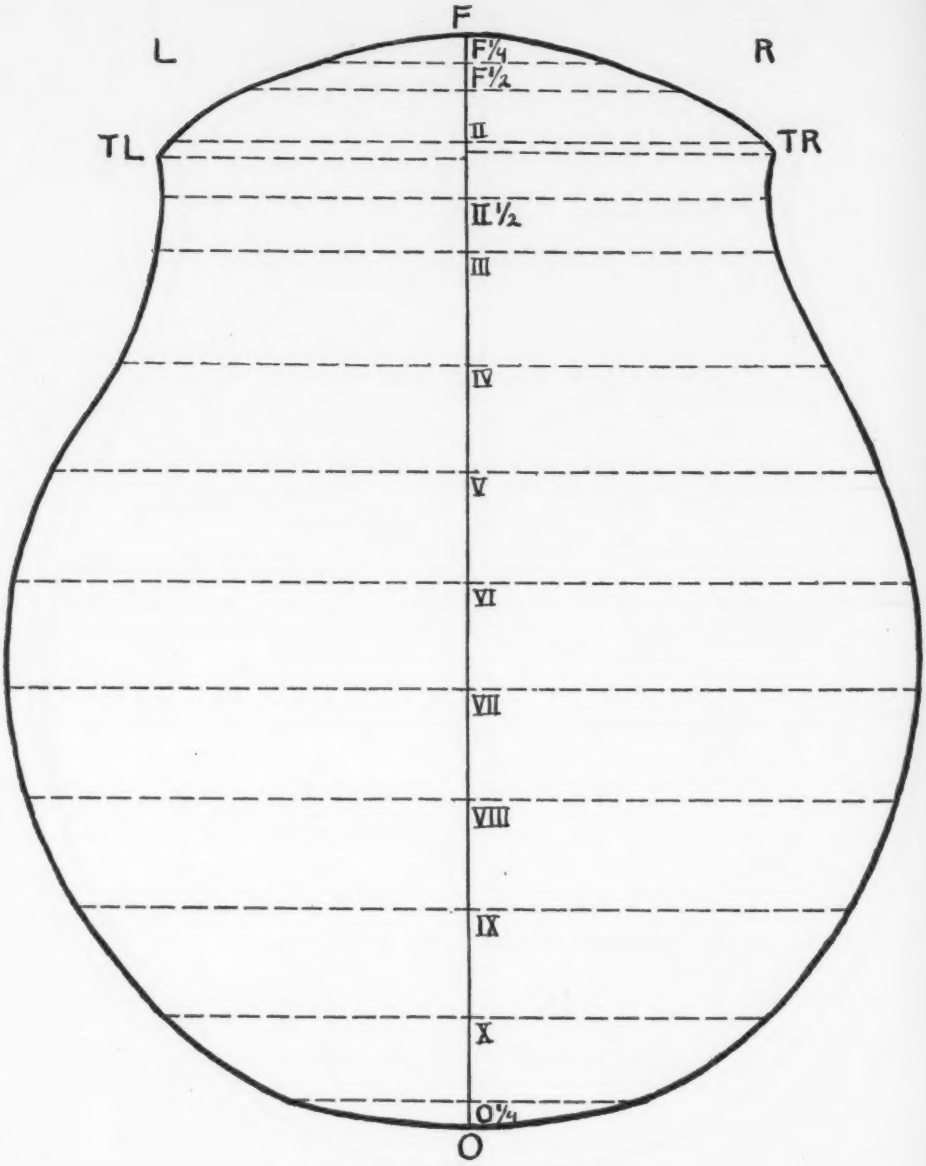


Fig. 11. Aëtas ♂ (30). Horizontale Typen Kontur.

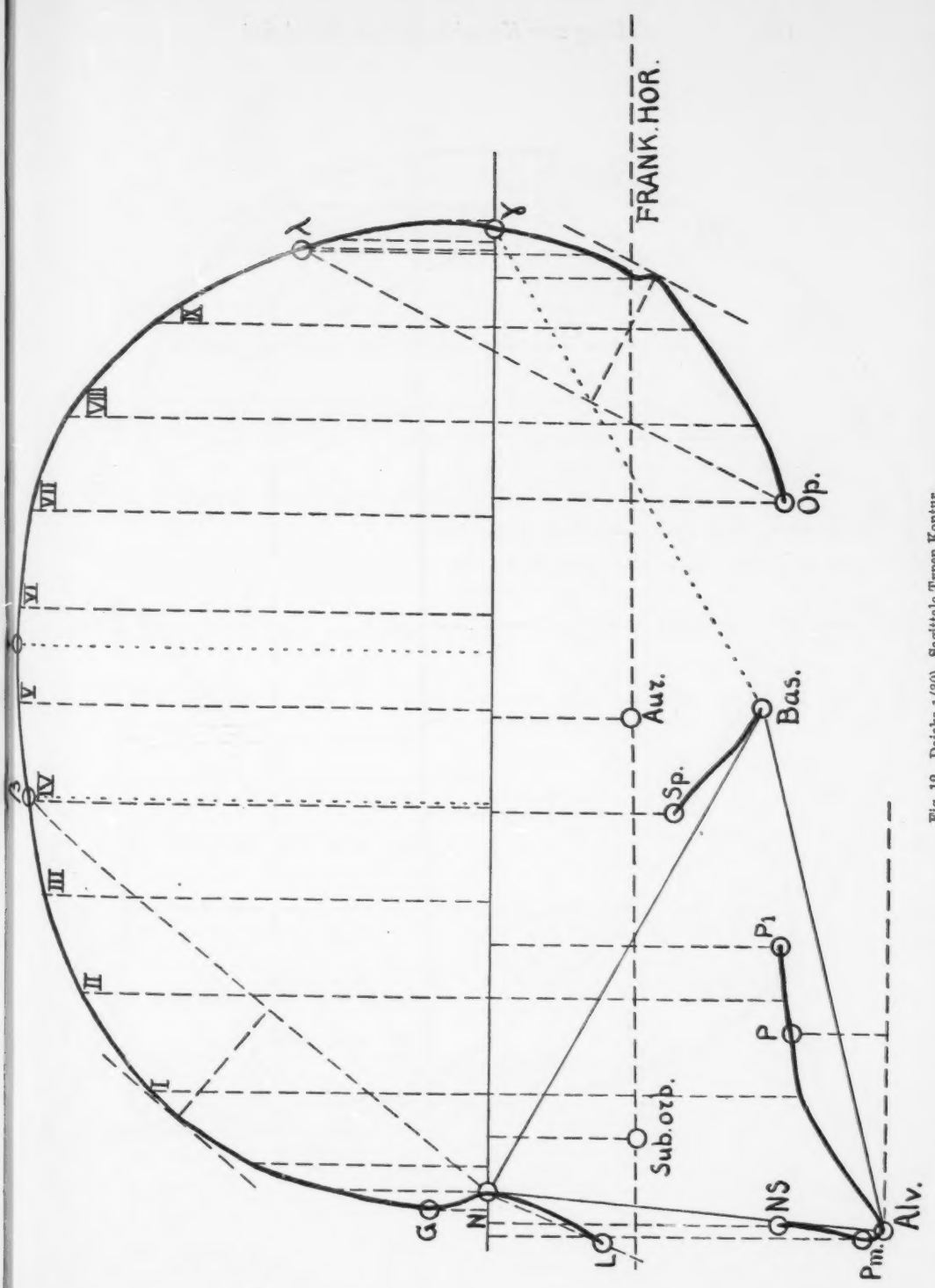
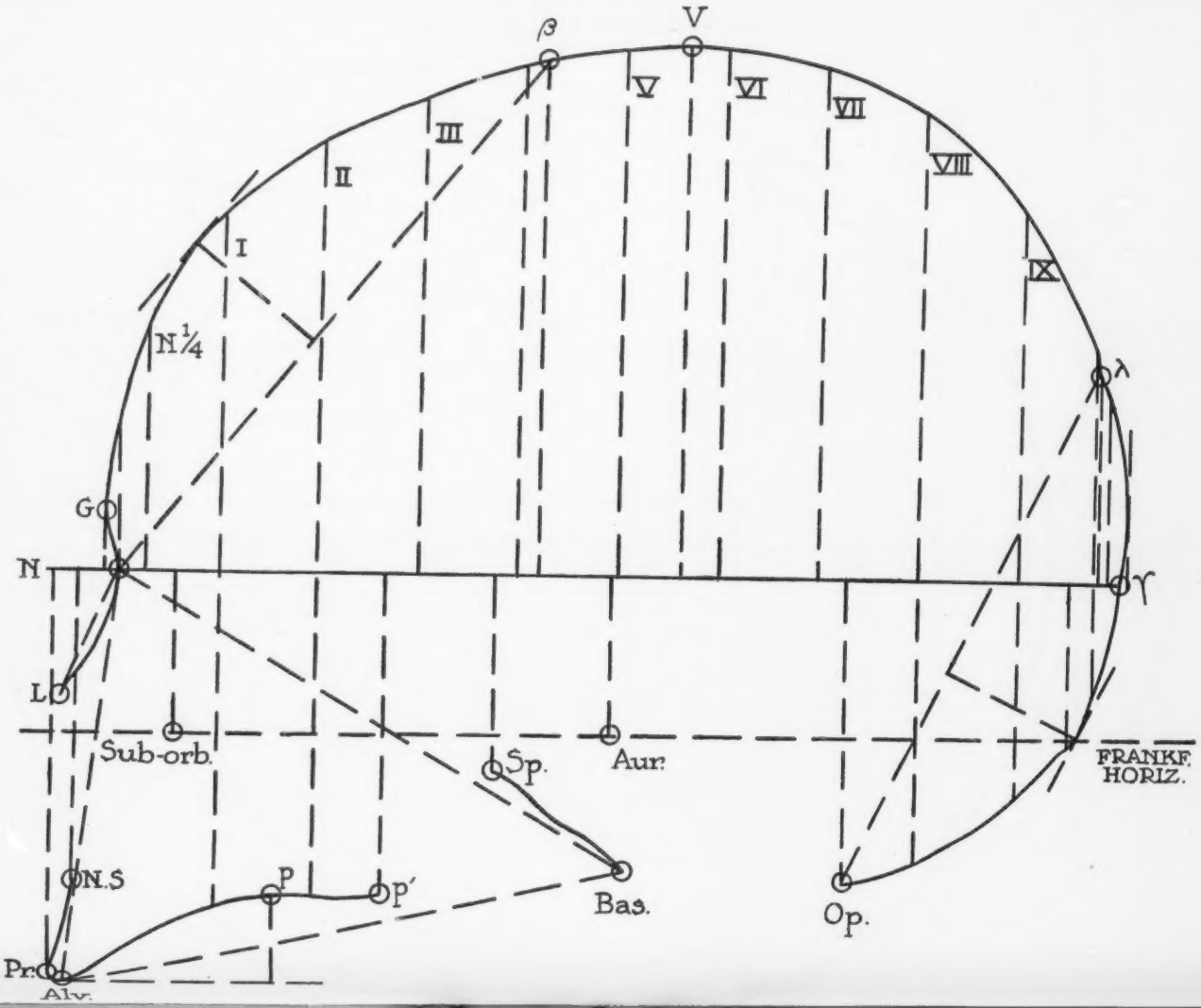


Fig. 12. Dajaks ♂ (30). Sagittale Typen Kontur.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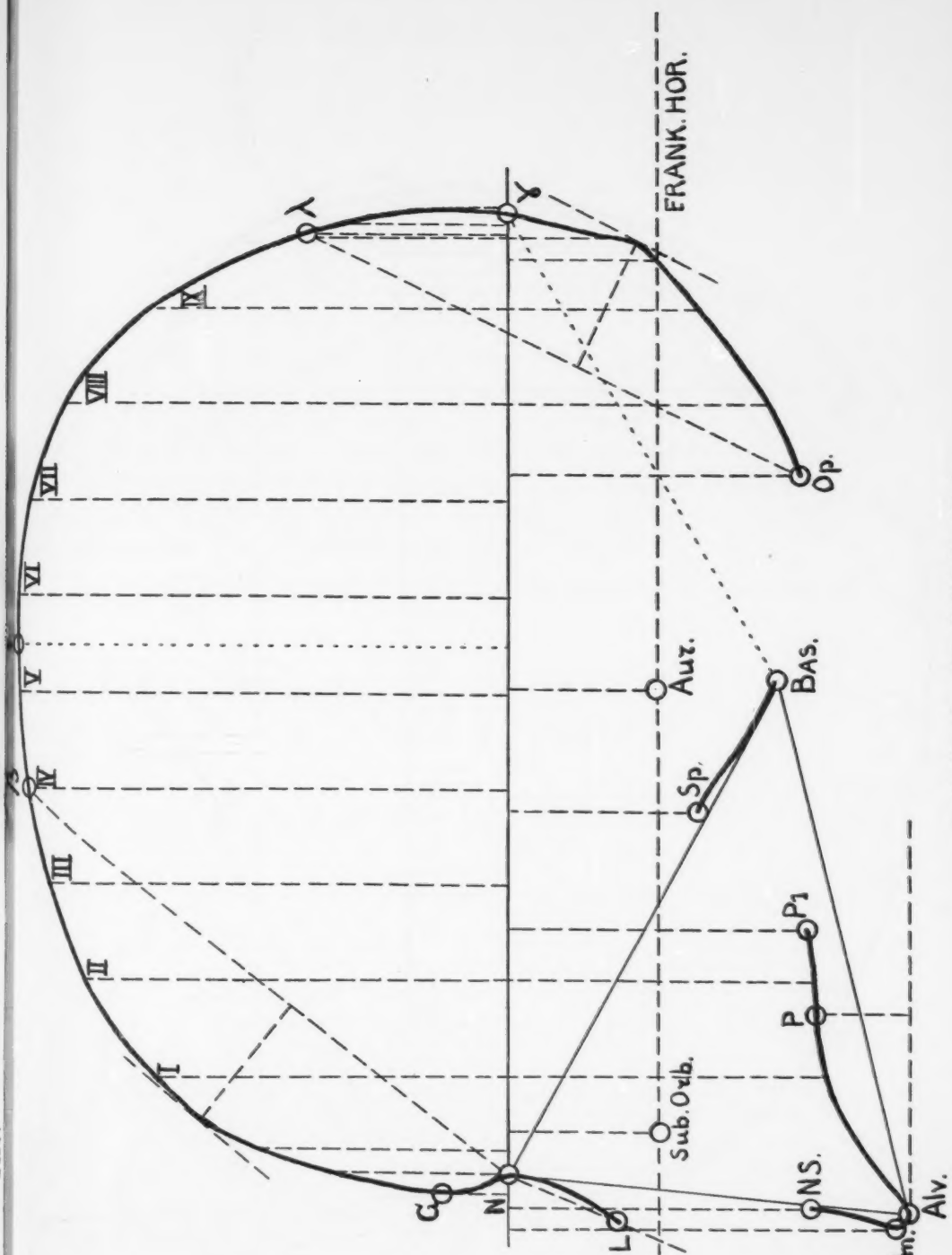
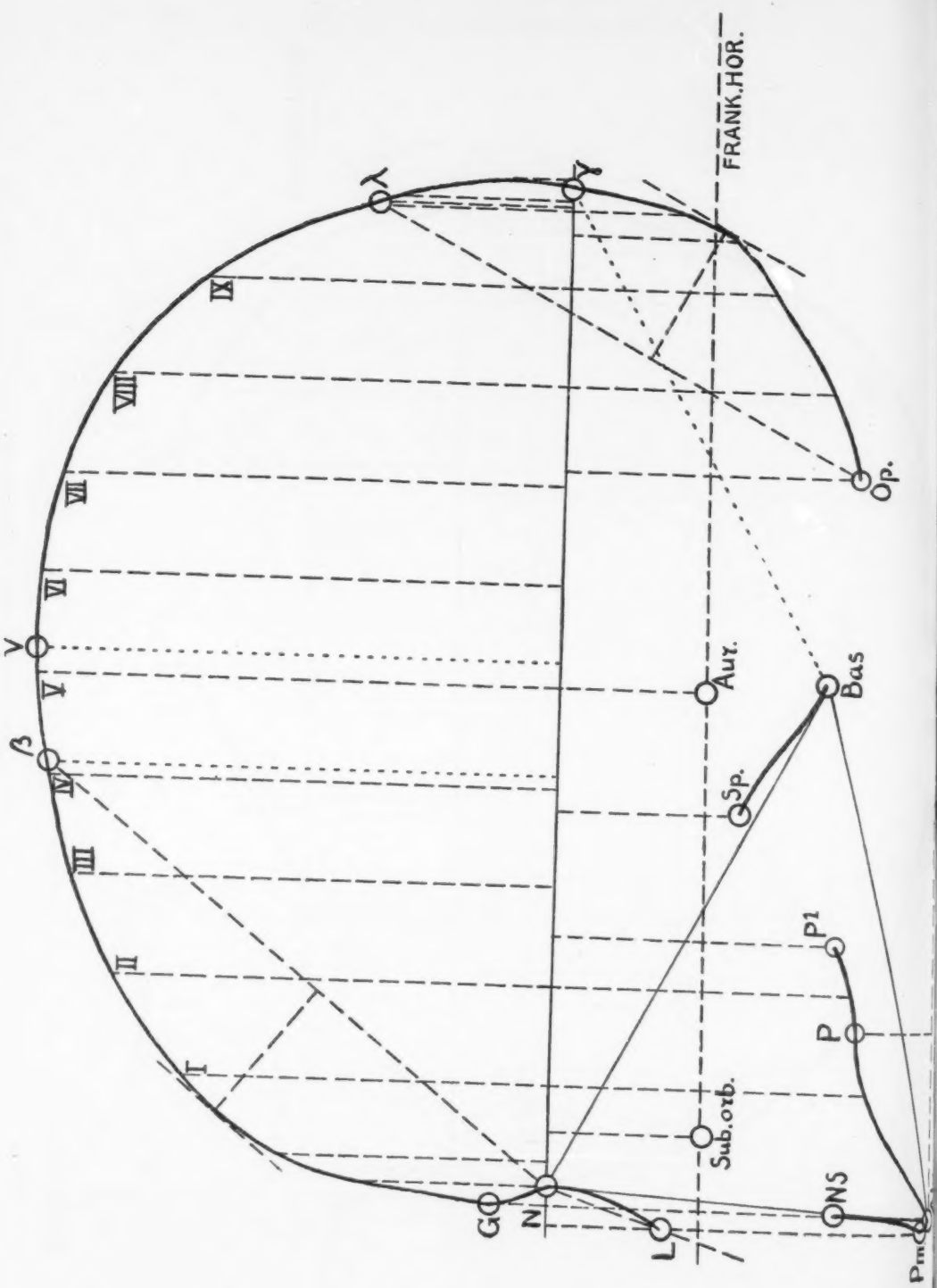


Fig. 14. Mittel-Java ♂ (80). Sagittale Typen Kontur.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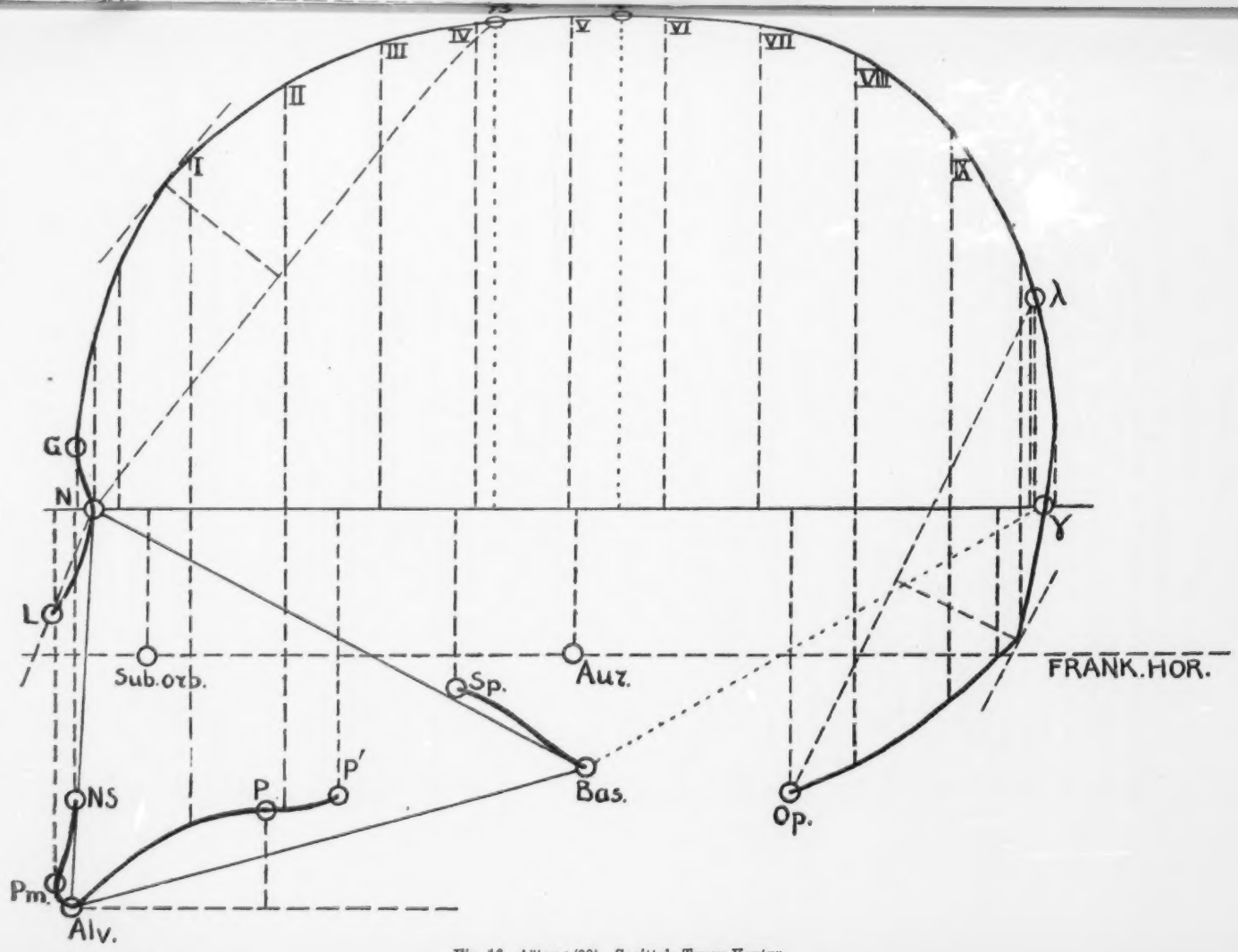

Fig. 16. Aëtas ♂ (30). Sagittale Typen Kontur.

ANHANG II.

LITERATUR.

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THE ANALYSIS OF VARIANCE IN CASES OF NON-NORMAL VARIATION.

By EGON S. PEARSON, D.Sc.

(1) *The Problem.*

In its simplest form, the problem to be discussed may be illustrated on the following example, the data for which are taken from a paper by Dr W. A. Shewhart of the Bell Telephone Laboratories, New York*. Table I contains records of 200 tests for insulation resistance made upon a certain material which was under examination in those Laboratories. In order to determine whether the construction and testing of the material were remaining uniformly under control, or were varying from day to day more than would be expected through chance, the observations have been broken up into subsets. I have chosen subsets of 10; thus the first column of 10 represents the results of the first group of 10 experiments, the second column, of the second group of 10, and so on up to the twentieth. At the bottom of each column is given the mean of the 10 values. The practical problem is to ascertain whether or not it is likely that these differences in means are significant; that is to say, we wish to test the hypothesis that the variation among the means of the 20 groups is no more than might be expected through chance, having regard to the observed variation among the individual values.

If x represent the group number and y the resistance, the problem reduces to that of testing the significance of the correlation ratio, $\eta_{y.x}$. Suppose that the total of N observations is divided into k groups of size, $n_1, n_2 \ldots n_k$, and that $\bar{y}_x$ and s_x represent the observed mean and standard deviation† in the xth group ($x = 1, 2 \ldots k$); further that $\bar{y}$ is the mean of the whole N values. In the present example

$$N = 200, \qquad k = 20, \qquad n_x = 10 \ (x = 1, 2 \ldots k).$$

Then upon the assumption that the observations in the groups or arrays have been drawn from normally distributed universes with a common (but unknown) standard deviation σ, the problem has been solved. We may either calculate

$$\eta^2 = \underset{x}{S}\{n_x(\bar{y}_x - \bar{y})^2\}/\underset{x}{S}\{(y - \bar{y})^2\}‡ \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

and judge its significance by reference to the sampling distribution,

$$df = \text{constant} \times (\eta^2)^{\frac{1}{2}(k-1)-1}(1 - \eta^2)^{\frac{1}{2}(N-k)-1}\, d\eta^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots(2).$$

* *The American Mathematical Monthly*, Vol. XXXVIII. p. 252, May 1931. I have used the first 200 of the 204 observations there given.

† Here and throughout the paper the sample variance, s_x^2, is taken as the sum of the squares of the deviations from the sample mean divided by the sample size, n_x.

‡ In this expression $\underset{x}{S}$ indicates summation for each of the k groups, and S the sum for each of the N observations.

TABLE I.

Tests for Control of Insulation Resistance in Manufacture.

Groups of 10 Observations

Resistance in Megohms (Central Values)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Totals
2875						1	1														2
3025													1								1
3175																					—
3325		1																			1
3475		1	2						2						4						8
3625		2	1		1										1						3
3775	3												1		1						8
3925			1	1			1		3			2	2	1						1	15
4075	2			1	2	4		4		3	3	1	1	1	2			1		2	19
4225	3		1	1	1	3	5		1	2	2	1	3	3			2		1	1	31
4375	1		2	1		1				2	2	2		2		2		1	3	3	21
4525		1	4	2	1	1	1	4	3	2		3		1		1	2		3	3	21
4675			1	4	3		2	2		1	3		2	3	1	4	3	3	2	1	27
4825	1				1					2					1	2	3		1		18
4975			1				2	2								1	1	3		1	9
5125		2																1			2
5275		1																			1
5425		1																1			1
5575					1																1
5725																					
Means	4300	4340	4640	4600	4660	4200	4340	4580	4200	4660	4470	4380	4140	4510	4090	4790	4820	4960	4640	4440	4488

Methods of dealing with this Type I distribution have been discussed elsewhere*. Alternatively we may follow R. A. Fisher's procedure of "analysis of variance," and make the following table,

	Sum of squares	Degrees of freedom
From variation of means	$S_x\{n_x(\bar{y}_x-\bar{y})^2\}$	$k-1$
From variation about means	$S_x\{n_x s_x^2\}$	$N-k$
Total	$S\{(y-\bar{y})^2\}$	$N-1$

Then if the hypothesis that the means only differ through chance fluctuations be true, $S_x\{n_x(\bar{y}_x-\bar{y})^2\}/(k-1)$ and $S_x\{n_x s_x^2\}/(N-k)$ will be two independent estimates of the unknown group variance σ^2. The hypothesis is tested by examining the significance of z, the natural logarithm of the ratio of these two estimates of variance†.

For the example of Table I, I find $\eta^2 = \cdot2532$, while for the sampling distribution (2)

$$\text{Mean } \eta^2 = \frac{k-1}{N-1}, \qquad \sigma_{\eta^2} = \frac{1}{N-1}\sqrt{\frac{2(k-1)(N-k)}{N+1}} \quad \ldots\ldots\ldots(3),$$

giving in the present instance: Mean $\eta^2 = \cdot0955$, $\sigma_{\eta^2} = \cdot0293$‡. Hence

$$(\text{Observed } \eta^2 - \text{Mean } \eta^2)/(\text{Standard Error}) = (\cdot2532 - \cdot0955)/\cdot0293 = 5\cdot4,$$

and is clearly significant.

Using Fisher's method it is found that $z = \cdot577$; entering the tables of z with $n_1 = k-1 = 19$ and $n_2 = N-k = 180$, it may be estimated that in only 1% of random samples z would exceed the value of about $\cdot38$, if the hypothesis tested were true. The observed value is therefore clearly significant.

The two tests must of course lead to identical results, since z is a single valued function of η^2, in fact

$$z = \tfrac{1}{2}\log_e\{(N-k)\,\eta^2/(k-1)\,(1-\eta^2)\} \quad \ldots\ldots\ldots\ldots\ldots\ldots(4).$$

There is no doubt therefore that the manufacture of the insulating material or the method of testing were undergoing changes during the period of experimentation. In fact it is interesting to note that a statistical analysis along these lines actually enabled Dr Shewhart to identify and remove certain causes of variation.

Let us now consider the assumptions involved in applying the test.

(*a*) That the k groups or samples have been drawn from universes with a common variance. This is a hypothesis that may or may not be true; a method of testing it has been developed elsewhere by Dr J. Neyman and the present writer§. If it be not true, it is probable that the test for the difference in means will not be seriously invalidated, unless the difference in group variances be very considerable‖.

* *Biometrika*, Vol. XXI. pp. 350—355.

† Tables of the 5% and 1% points for z are given in R. A. Fisher's *Statistical Methods for Research Workers*.

‡ These values can be obtained from T. L. Woo's Tables, *Biometrika*, Vol. XXI. pp. 10—66; also *Tables for Statisticians*, Part II, Table IV.

§ In a paper in course of publication in the *Bulletin of the Polish Academy of Science and Letters*.

‖ A single experiment on this point was carried out by the writer, *Biometrika*, Vol. XXI. pp. 346—349.

(*b*) That the samples have been drawn from normally distributed material. It is the object of the present paper to examine the effect of non-normality. In the example of Table I it is found that on combining the 200 observations

$$\sqrt{\beta_1} = -\cdot760, \quad \beta_1 = \cdot578, \quad \beta_2 = 4\cdot317.$$

The divergence from normality is clearly significant*. Now it is true that this divergence may be due to the heterogeneity of the material. But the fact that the group means differ significantly could not be established until the η^2 or z-test had been applied, and logically if any value is to be placed on the result of this test, the user must have confidence that it remains valid for homogeneous material which is not normally distributed.

In section (3) below the results of experimental sampling from a variety of non-normal distributions following Pearson-type curves are discussed, and it will be

THE STUDY OF NON-NORMAL VARIATION.

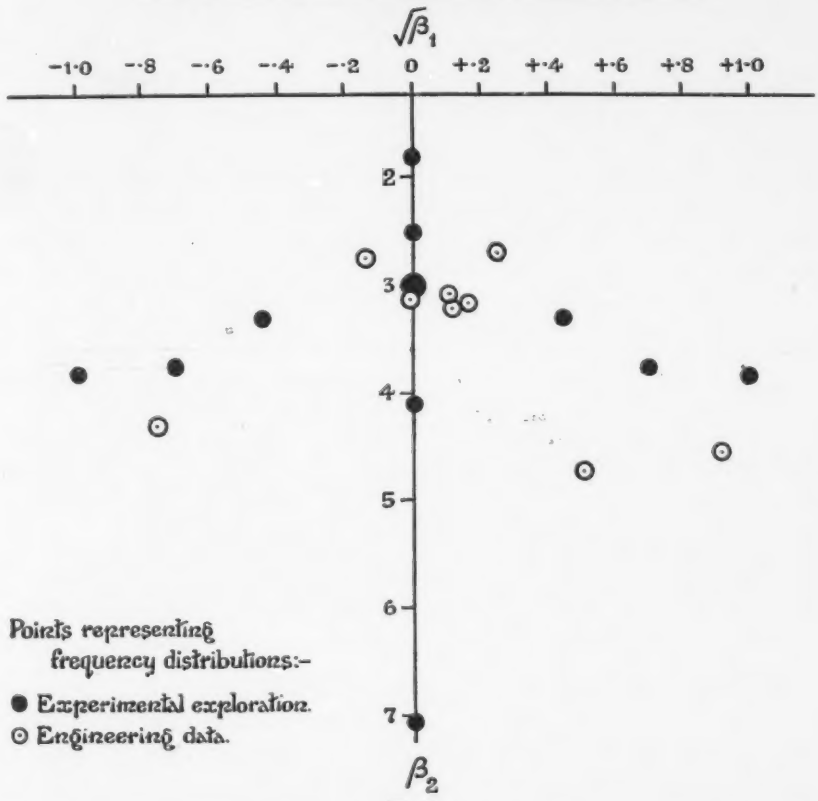


Fig. 1.

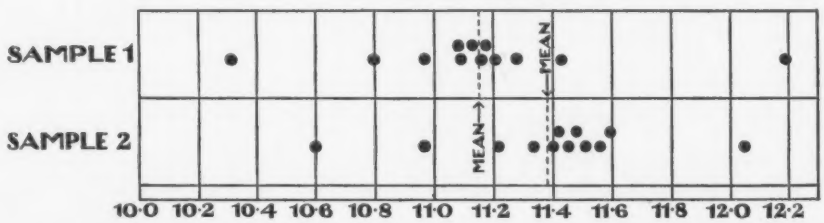
* See for example Table XXXVII[1a], *Tables for Statisticians and Biometricians*, Part II.

shown that the sampling distribution of η^2 is remarkably insensitive to changes in population form. The field covered by this experimental work is shown in Figure 1, in which the solid black circles indicate the values of $\sqrt{\beta_1}$ and β_2 of the curves used to represent the population distributions*. I have also shown on this diagram the $(\sqrt{\beta_1}, \beta_2)$ points of a variety of frequency distributions each based on several hundred observations collected by the Bell Telephone Laboratories in the course of their work and kindly placed at my disposal by Dr W. A. Shewhart. Except for the point at $\sqrt{\beta_1} = -\cdot760$, $\beta_2 = 4\cdot317$ representing the example discussed above, Dr Shewhart informs me that the material was believed to be homogeneous, that is to say the underlying cause systems were constant. It will be seen that the experimental field represents a very fair sounding of that met on this practical experience. If some of the leptokurtic distributions found by "Student"† in problems of chemical analysis were added, the purpose of the trial point at $\sqrt{\beta_1} = 0$, $\beta_2 = 7\cdot1$ would be realised.

In the following sections we shall therefore consider how far the law of equation (2) continues to represent the distribution of η^2 when k groups of size $n_1, n_2 \ldots n_k$ respectively are drawn at random from a common non-normal population. If this be found to be so within a wide range of populations we shall know that one source of error remains controlled. Should we adopt, for example, the rule of rejecting the hypothesis of a common origin for the groups when η^2 exceeds the appropriate 1 % value, then out of the cases where the hypothesis is really true, we shall make in the long run 1 mistaken judgment out of 100. And this will be true within wide limits whether the population be normal or not. The other form of error is more difficult to appreciate; when the variation diverges considerably from the normal, the η^2-test becomes inefficient because it will pass over as acceptable cases where the group means are significantly different, which a more appropriate test would throw out. This is a theoretical field in which exploration has hardly commenced, and for the present we must be satisfied if we can show that the "normal theory" test at any rate provides a fair control of the first source of error.

Perhaps, however, the following illustration of a rather extreme case will serve to show the nature of the problem still to be solved. A special case of the test

FIGURE 2.



* Since the problem is the same whether the skewness be positive or negative, the experimental points have been drawn reflected in the $\sqrt{\beta_1}$ axis.

† See for example "Student's" paper on Routine Analysis, *Biometrika*, Vol. XIX. pp. 151—164.

occurs when $k=2$, and Fig. 2 represents diagrammatically two samples of 12 scaled observations, drawn it may be supposed from symmetrical, but very leptokurtic distributions. In this case

$$n_1=n_2=12; \quad \text{Mean} \quad \bar{x}_1=11{\cdot}1517, \quad \bar{x}_2=11{\cdot}3825.$$
$$\text{Variances} \quad s_1^2={\cdot}1709, \quad s_2^2={\cdot}1136.$$

We may ask whether the means differ significantly, assuming that the variances do not. The experimental results discussed below suggest that if the population value of β_2 is at any rate not greater than about 7, the distribution of the criterion t of equation (21) below will still follow approximately "Student's" law (22) below, if the samples have come from a common parent population.

It is found that $t=-1{\cdot}44$ and the tables* show that in as many as about 16 pairs of samples out of 100 a value of t outside the limits $\pm 1{\cdot}44$ would be reached through chance. Yet a glance at the diagram suggests that the hypothesis of a common origin for the samples is almost certainly untrue. In each sample there are two central blocks of points clustering about differently placed means; the two or three extreme points have however given high values to the standard deviations, leading to a relatively low value of t. In such a case in fact t is no longer an efficient criterion for the purpose of discrimination, because the standard deviation is not a satisfactory measure of variation when samples are drawn from very leptokurtic distributions.

(2) *A brief mathematical Analysis of the Position.*

In an earlier paper†, after giving a summary of R. A. Fisher's deduction of the distribution law of equation (2) above, I discussed briefly the possible effect of non-normality. It seems well to give here a brief summary of a somewhat more extensive analysis of the problem.

The "normal theory" proof depends upon the fact that

$$\theta=\eta^2(1-\eta^2)=h/q$$

is the ratio of two independent quantities,

$$h=\sum_x\{n_x(\bar{y}_x-\bar{y})^2\}/\sigma^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5),$$

$$q=\sum_x(n_x s_x^2)/\sigma^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(6),$$

both of whose sampling distributions are Type III curves. To investigate the position more fully the values of Mean $(h)=\bar{h}$, Mean $(q)=\bar{q}$, σ_h^2, σ_q^2 and $r_{hq}\sigma_h\sigma_q$ have been obtained, on the hypothesis that sets of k samples of size $n_1, n_2 \ldots n_k$ are drawn randomly from a population distribution which is not normal‡. The results are as

* Student's Tables given in *Metron* v. 1925, pp. 113—128.

† *Biometrika*, Vol. XXI. pp. 338—344.

‡ This point should be remembered, namely, that we are considering the variation in θ or η^2 when repeated sets of samples are drawn in which the n_x's retain the same values from set to set. This is the situation contemplated when discussing a problem of group differentiation such as that illustrated in Table I. If the problem is one in which the n_x's should be thought of as varying from sample to sample, the position is not so simple, for in this case it is only when the variation is normal that the distributions of h and q are independent of n_x.

follows and they have been obtained by extending the method employed in section (4) of the paper referred to above. Equations (8) and (10) are in fact taken directly from pp. 343—44 of that paper.

$$\text{Mean } (h) = \bar{h} = k - 1 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7),$$

$$\text{Mean } (q) = \bar{q} = N - k \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8).$$

$$\sigma_h^2 = 2(k-1) + (\beta_2 - 3)\left\{S_x\left(\frac{1}{n_x}\right) + \frac{1-2k}{N}\right\} \quad \ldots\ldots\ldots\ldots\ldots (9),$$

$$\sigma_q^2 = 2(N-k) + (\beta_2 - 3)\left\{S_x\left(\frac{1}{n_x}\right) + N - 2k\right\} \quad \ldots\ldots\ldots\ldots\ldots (10),$$

$$r_{hq}\sigma_h\sigma_q = (\beta_2 - 3)\left\{k - 1 + \frac{k}{N} - S_x\left(\frac{1}{n_x}\right)\right\} \quad \ldots\ldots\ldots\ldots\ldots (11).$$

In the simple but important case in which all the groups contain the same frequency, $k \times n_x = N$, $(x = 1, 2 \ldots k)$ or

$$S_x\{1/n_x\} = k^2/N \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12),$$

and it follows that

$$\sigma_h^2 = 2(k-1)\{1 + \tfrac{1}{2}(\beta_2 - 3)(k-1)/N\} \quad \ldots\ldots\ldots\ldots\ldots (13),$$

$$\sigma_q^2 = 2(N-k)\{1 + \tfrac{1}{2}(\beta_2 - 3)(N-k)/N\} \quad \ldots\ldots\ldots\ldots\ldots (14),$$

$$r_{hq}\sigma_h\sigma_q = (\beta_2 - 3)(k-1)(N-k)/N \quad \ldots\ldots\ldots\ldots\ldots (15).$$

If $\beta_2 = 3$ it will be seen that $r_{hq} = 0$, and σ_h and σ_q assume the "normal theory" values of $\sqrt{2(k-1)}$ and $\sqrt{2(N-k)}$.

We are concerned with the sampling distribution of $\theta = \eta^2/(1-\eta^2) = h/q$. Some appreciation of its change in form with β_2 can be obtained from approximations to its mean value and standard deviation. If we write $h = \bar{h} + \delta h$ and $q = \bar{q} + \delta q$, then

$$\theta = \frac{\bar{h}}{\bar{q}}\left\{1 + \frac{\delta h}{\bar{h}} - \frac{\delta q}{\bar{q}} + \frac{\delta q^2}{\bar{q}^2} - \frac{\delta h\,\delta q}{\bar{h}\bar{q}} \ldots\right\} \quad \ldots\ldots\ldots\ldots\ldots (16).$$

Hence it follows that

$$\text{Mean } (\theta) = \frac{\bar{h}}{\bar{q}}\left\{1 + \frac{\sigma_q^2}{\bar{q}^2} - \frac{r_{hq}\sigma_h\sigma_q}{\bar{h}\bar{q}} + \ldots\right\} \quad \ldots\ldots\ldots\ldots\ldots (17),$$

$$\text{Mean } (\theta^2) = \left(\frac{\bar{h}}{\bar{q}}\right)^2\left\{1 + \frac{\sigma_h^2}{\bar{h}^2} - \frac{4r_{hq}\sigma_h\sigma_q}{\bar{h}\bar{q}} + \frac{3\sigma_q^2}{\bar{q}^2} + \ldots\right\} \quad \ldots\ldots\ldots\ldots\ldots (18).$$

If we may use (12), which will be a fairly good approximation even though the group frequencies are not exactly equal, it is found on inserting (7), (8), (13), (14) and (15) into (17) and (18) that *the coefficients of the terms in* $(\beta_2 - 3)$ *vanish.* In fact we obtain

$$\text{Mean } \theta = \frac{k-1}{N-k}\left\{1 + \frac{2}{N-k} + \ldots\right\}; \qquad \sigma_\theta^2 = \frac{2(k-1)(N-1)}{(N-k)^3} + \ldots \quad \ldots (19).$$

It follows that in so far as the relation (12) and the expansion (16) up to the second order terms only are adequate, the values of Mean θ and σ_θ are independent of the distribution of y. Consequently we should expect that the sampling distribution of θ—and therefore of η^2—will not be very sensitive to changes in population form, and this is confirmed by the experimental results considered below.

It is also of interest to note that the existence of a correlation between h and q when β_2 differs from 3 contributes to this result. In the different problem where we are comparing two essentially different estimates of variance, such as the variances s_1^2 and s_2^2 found in two independent samples, the distribution of the ratio is considerably more sensitive to changes in population form because of the absence of this correlation. This point will be illustrated in section (4) below.

(3) *Results of Experimental Sampling.*

The forms of the six population distributions used in sampling have been described elsewhere*. Fig. 3 shows the shapes of the four most extreme curves, while the $(\sqrt{\beta_1}, \beta_2)$ points are plotted in Fig. 1. They will be referred to as on p. 122 by their (β_1, β_2) values.

The distributions (0·0, 7·1) and (1·0, 3·8) are undoubtedly of rather extreme form, and in dealing with samples from these the standard deviation ceases to be a very efficient measure of variation. It appears, however, of interest to ascertain, even in such extreme cases, how far the sampling distributions of the various criteria used in statistical tests are still approximated to by the "normal theory" law.

The distribution of η^2 depends upon the number of groups or arrays, k, and the total size of the sample, N. I have chosen a series of values for k and N which is of course by no means exhaustive, and in the case where N is large, my material was not sufficient to provide many sets of samples. But a fairly wide field has been surveyed; and it has been the small sample field, simply because this is the most critical region in which divergences from "normal theory" may be expected to be greatest.

(a) *The Case $k = 2$.*

If there are only two groups, the problem reduces to that of testing the significance of the difference between the means of two samples. It is easy to show that the η^2 of (1) reduces so that

$$\theta = \eta^2/(1-\eta^2) = t^2/(n_1+n_2-2) \quad \text{.....(20),}$$

where

$$t = \frac{\bar{y}_1 - \bar{y}_2}{\sqrt{\dfrac{n_1 s_1^2 + n_2 s_2^2}{n_1+n_2-2}\left(\dfrac{1}{n_1}+\dfrac{1}{n_2}\right)}} \quad \text{.....(21),}$$

or is the ratio of the difference in means to a sample estimate of the standard error of this difference. Consequently η^2 will be distributed according to equation (2), if the distribution of $|t|$ (the positive value of t) between 0 and $+\infty$ follows the half of the appropriate "Student" Type VII curve (22). This point was examined in a previous paper† for certain of the experimental populations, in the cases

(i) $n_1 = 5$, $n_2 = 10$, (ii) $n_1 = 5$, $n_2 = 20$, and (iii) $n_1 = 10$, $n_2 = 20$.

* Five of them were described in *Biometrika*, Vol. XXI. p. 263. A sixth has been since added, namely, a very skew Type I distribution for which $\beta_1 = 0{\cdot}99$, $\beta_2 = 3{\cdot}83$ and with a standard deviation equal to 12·37 of the grouping units. Most of the sampling and a portion of the computing work on this population were undertaken by Prof. T. Kondo who kindly placed his results at my disposal. The detailed frequency distributions for the six cases have since been tabled by Dr J. M. le Roux, *Biometrika*, Vol. XXIII. p. 160.

† *Biometrika*, Vol. XXI. pp. 274—276. In that paper "Student's" original notation of z was used. The use of $t = z\sqrt{n_1+n_2-2}$, seems however more satisfactory.

Symmetrical Curves	(0·0, 2·5),	(0·0, 4·1), (0·0, 7·1).
Type III Curves	(0·2, 3·3),	(0·5, 3·7).
Type I Curve	(1·0, 3·8).	

DISTRIBUTION CURVES OF POPULATIONS SAMPLED.

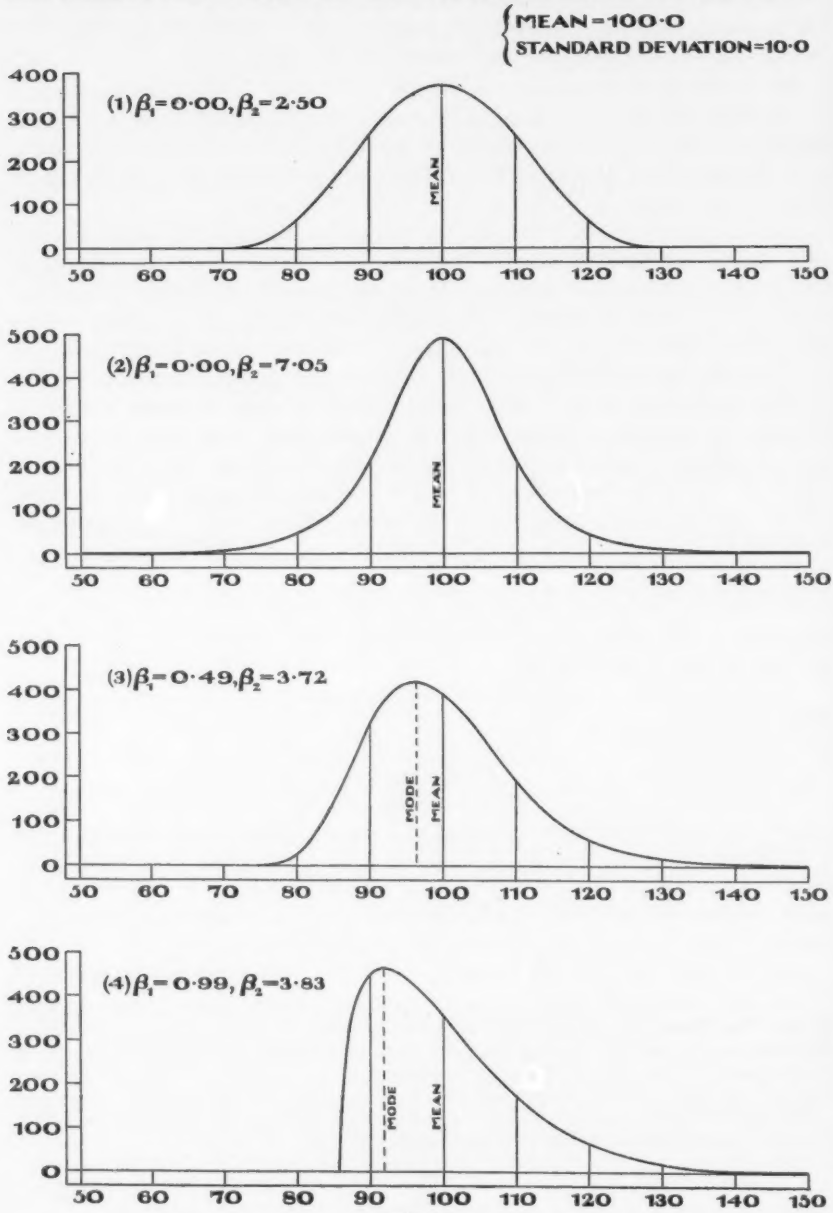


Fig. 3.

The results have since been somewhat extended and a summary of the most relevant information is given in Tables II and III below.

The observed sampling frequencies have been compared with three theoretical sets of values.

(1) Those obtained from "Student's" curve, namely

$$df = \text{constant}\,\{1 + t^2/(n_1 + n_2 - 2)\}^{-\frac{1}{2}(n_1+n_2-1)}\,dt \quad \ldots\ldots\ldots\ldots\ldots\ldots(22).$$

(2) Those obtained by assuming that t is adequately represented by a normal curve with standard deviation equal to the σ_t of equation (22), namely

$$\sigma_t = \sqrt{(n_1 + n_2 - 2)/(n_1 + n_2 - 4)}.$$

This is called "normal curve (a)" in Tables II and III.

(3) Those obtained by using $s_0^2 = (n_1 s_1^2 + n_2 s_2^2)/(n_1 + n_2)$, instead of

$$(n_1 s_1^2 + n_2 s_2^2)/(n_1 + n_2 - 2),$$

as an estimate of the unknown population σ^2, and consequently assuming that $\bar{y}_1 - \bar{y}_2$ is distributed in random samples with a standard error of $s_0\sqrt{(n_1 + n_2)/n_1 n_2}$. This would lead to the supposition that the sampling distribution of t could be represented by a normal curve with standard deviation $\sqrt{(n_1 + n_2 - 2)/(n_1 + n_2)}$, and this curve gives the frequencies headed "normal curve (b)" in the tables.

TABLE II.

The Case of 2 Groups.

Frequencies in 500 Pairs of Samples.

Size of Samples		$\lvert t \rvert$ greater than	Expected			Observed in Experimental Sampling from Populations						Average of Experimental Values
n_1	n_2		Student's curve	Normal curve (a)	Normal curve (b)	(0·0, 2·5)	(0·0, 4·1)	(0·0, 7·1)	(0·2, 3·3)	(0·5, 3·7)	(1·0, 3·8)	
5	5	2·400	21·6	18·8	3·6	30	21	21	17	16	12	19·5
		3·400	4·7	1·6	0·07	8	2	5	4	6	2	4·5
5	10	2·208	22·9	21·1	8·9	15	21	35	22	23	24·5*	23·4
		2·944	5·7	3·4	0·78	7	3	7	5	6	8*	6·0
5	20	2·145	21·4	20·2	12·7	23	21	23	23	18*	20	21·3
		2·788	5·2	3·9	1·8	6	3	4	6	1·5*	3	3·9
10	10	2·100	25·0	23·9	13·4	—	—	—	—	—	25	—
		2·850	5·3	3·6	1·3	—	—	—	—	—	5	—
10	20	2·160	19·7	18·7	12·7	25	17	19	25	19	20	20·8
		2·808	4·4	3·4	1·8	8	5	5	6	3	7	5·7
20	20	1·962	28·6	28·1	22·1	—	—	—	—	24	—	—
		2·615	6·4	5·4	3·6	—	—	—	—	7	—	—

* Figures reduced from 1000 observations.

TABLE III‡.

The Case of 2 Groups.

n_1, n_2		σ_t, Normal Theory	Observed in Experimental Sampling from Populations					
			(0·0, 2·5)	(0·0, 4·1)	(0·0, 7·1)	(0·2, 3·3)	(0·5, 3·7)	(1·0, 3·8)
5, 5	σ_t	1·155	1·217	1·153	1·164	1·140	1·099	1·099
	(Obs. − Theo.)/S. E.		+1·29	−0·04	+0·19	−0·31	−1·17	−1·17
	Student's χ^2		14·93	6·47	25·46	13·21	8·68	35·12
	Student's P		·312	·925	·020	·432	·796	·002
	Normal Curve (a) χ^2		38·67	13·73	21·36	7·81	19·44	30·82
	Normal Curve (a) P		<·001	·394	·067	·855	·111	·004
5, 10	σ_t	1·087	1·089	1·086	1·196	1·090	1·090	1·107*
	(Obs. − Theo.)/S. E.		+0·05	−0·02	+2·72	+0·07	+0·07	+0·71
	Student's χ^2		19·1†	13·33	31·0†	16·8†	12·9†	15·70
	Student's P		·264	·649	·013	·401	·677	·614
	Normal Curve (a) χ^2		18·51	9·87	40·52	—	15·01	20·40
	Normal Curve (a) P		·296	·873	<·001	—	·524	·311
5, 20	σ_t	1·047	1·043	1·022	1·093	1·057	1·001*	1·042
	(Obs. − Theo.)/S. E.		−0·11	−0·69	+1·28	+0·28	−1·84	−0·14
	Student's χ^2		9·0†	11·99	10·7†	11·5†	19·2†	10·99
	Student's P		·620	·363	·465	·393	·085	·444
	Normal Curve (a) χ^2		10·06	14·36	9·71	—	18·06	9·35
	Normal Curve (a) P		·525	·215	·557	—	·114	·590
10, 20	σ_t	1·038	1·030	1·031	1·043	1·049	1·057	1·095
	(Obs. − Theo.)/S. E.		−0·23	−0·20	+0·14	+0·31	+0·54	+1·62
	Student's χ^2		17·3†	7·07	4·7†	14·3†	16·4	11·42
	Student's P		·099	·793	·943	·217	·128	·409
	Normal Curve (a) χ^2		21·49	7·38	5·01	—	13·83	10·52
	Normal Curve (a) P		·029	·766	·931	—	·243	·485

Additional Results		$n_1 = 10 = n_2$ Population (1·0, 3·8)	$n_1 = 20 = n_2$ Population (0·5, 3·7)
σ_t	Observed ...	1·076	1·019
	Normal Theory	1·061	1·027
	(Obs. − Theo.)/S. E.	+0·41	−0·24
	Student's χ^2 ...	7·90	8·92
	Student's P ...	·927	·629
	Normal Curve (a) χ^2 ...	7·68	7·57
	Normal Curve (a) P ...	·935	·750

* In these two cases the results have been based on 1000 pairs of samples; in all the remaining cases there were 500 pairs.

† The values of P only were available in these cases at the time of writing up the paper; values of χ^2 were obtained from these roughly by interpolating backwards in to Elderton's Tables.

‡ The data were regrouped since the forming of Tables IV (a), (b) and (c) in *Biometrika*, Vol. XXI. pp. 275—277, and consequently the values of (P, χ^2) differ somewhat.

The comparison is of importance, as it will suggest an answer to the question *"If the sampled population be not normal, is it an unwarranted refinement to use the probability integral of 'Student's' curve when dealing with small samples?"*

Limits for t were chosen as near as possible to the 5 °/₀ and 1 °/₀ points of "Student's" curve*, and Table II shows the frequency among 500 samples with which $|t|$ was both "expected" on the different hypotheses and observed in the experiments to exceed the limits indicated in the 3rd column. In Table III I have first compared the observed values of σ_t (i.e. the standard deviations of the complete distribution of t, not of $|t|$) with the "normal theory" value of

$$\sqrt{(n_1+n_2-2)/(n_1+n_2-4)}.$$

The quantity (Obs. – Theo.)/S.E. is the difference of these values divided by the standard error. For the latter the approximation $\frac{1}{2}\sigma_t\sqrt{({}_t\beta_2-3)/M}$ has been used, where M is the number of pairs of samples (500 in all cases but two), and ${}_t\beta_2$ is the appropriate constant for the curve (22), namely $3+6/(n_1+n_2-6)$. Afterwards are given the results of the (P, χ^2) test obtained on fitting half of "Student's" curve and half the normal curve (a) to the observed distributions of $|t|$†.

The conclusions which it appears possible to draw from a study of these Tables may be summarised as follows:

(1) The observed values of σ_t agree on the whole very closely with the "normal theory" values, and there is no clearly marked systematic discrepancy. Possibly in the case of very small samples there is a tendency for σ_t to be too great when the population is leptokurtic, and too small when it is skew, but the evidence is somewhat conflicting.

(2) An analysis of the results of the χ^2 tests, using "Student's" curve, again does not appear to bring out any systematic rule of divergence. Taken as a whole the values of χ^2 are higher than we should expect if the variation from theory was solely due to chance. Also the fits are on the whole better for the larger sized samples.

(3) Such differences as can be picked out between the fits with "Student's" curve and those with normal curve (a), are slightly in favour of the former in the case of the smallest samples. By the time n_1 and n_2 are both as great as 10, there is practically no difference between the two.

(4) The relative values of the different curves is brought out well in Table II. It will be seen that for the smallest samples, normal curve (a) allows for considerably too few extreme variations. Owing to the necessity of grouping up at the tails, this point is not shown in the results of the goodness of fit tests. For example, for the case $n_1=5=n_2$, "Student's" curve predicts that in 4·7 samples out of 500, $|t|>3{\cdot}400$, while the normal curve (a) allows only 1·6. The observed six values were 8, 2, 5, 4,

* The ratio computed from the samples was not t, but a convenient multiple of this quantity. To obtain the frequency beyond the exact 5 °/₀ and 1 °/₀ points would have involved considerable extra labour, and is not essential to the argument.

† The number of groups used in the fitting were as follows:

$n_1=5=n_2$, 14 groups; $n_1=5$, $n_2=10$, 17 groups except in the case of Population—(1·0, 3·8) where 1000 pairs of samples were available and 19 groups were used; $n_1=5$, $n_2=20$, 12 groups (except for case (0·5, 3·7) where 13 were used); $n_1=10$, $n_2=20$, 12 groups; $n_1=10=n_2$, 16 groups; $n_1=20=n_2$, 12 groups.

6 and 2, giving an average of 4·5. The same situation will be observed for $n_1 = 5$, $n_2 = 10$. Taken as a whole the results suggest clearly that in dealing with very small samples, (say if $n_1 + n_2 < 20$), the use of the t-probability scale rather than the normal probability scale is justified, even if the population varies very considerably from the normal.

(5) The importance of adjusting the estimated standard error of the difference in means for the size of samples, is shown very clearly by the total inadequacy of prediction obtained in using normal curve (*b*) when the samples are small.

(*b*) *Cases with* $k > 2$.

In the following table crosses indicate the range of cases examined.

TABLE IV.

Populations sampled	20 groups of 2 ($N=40$, $k=2$)	10 groups of 4 ($N=40$, $k=4$)	5 groups of 5 ($N=25$, $k=5$)	10 groups of 5 ($N=50$, $k=5$)	10 groups of 10 ($N=100$, $k=10$)
Rectangular (0·0, 1·8)	—	×	—	—	—
(0·0, 2·5)	×	—	—	×	—
(0·0, 4·1)	×	—	—	×	—
(0·0, 7·1)	×	—	×	×	—
(0·5, 3·7)	×	—	×	—	×
(1·0, 3·8)	—	—	×	×	—

TABLE V (*a*).

20 *Groups of* 2.

Limits of η^2	Normal Theory Frequencies	Frequencies in Samples from Experimental Populations			
		(0·0, 2·5)	(0·0, 4·1)	(0·0, 7·1)	(0·5, 3·7)
Less than ·30	2·2	3	5	2	—
·30—·34	2·5	3	4	2	2
·34—·38	3·9	2	5	3	6
·38—·42	5·3	3	6	5	1
·42—·46	6·5	7	5	8	8
·46—·50	6·9	12	7	8	7
·50—·54	6·7	7	4	4	7
·54—·58	5·7	6	7	3	8
·58—·62	4·4	4	2	4	4
·62—·66	2·9	—	2	5	3
·66—·70	1·7	2	1	4	4
Greater than ·70	1·3	1	3	2	—
Totals	50·0	50	50	50	50
Mean η^2	·4872	·4816	·4628	·5036	·5048
σ_{η^2}	·1104	·1002	·1275	·1150	·0979
χ^2	—	4·62	5·00	4·01	1·64
P	—	·33	·29	·41	·80

Standard Errors for 50 Series: of Mean η^2, ·0156; of σ_{η^2}, ·0103.

The observed distributions of η^2 are compared with expected values calculated from equation (2) in Tables V (*a*), (*b*), (*c*), (*d*) and (*e*). The number of sets of samples used range only from 50 to 200; consequently no very critical analysis of the difference between observation and theory is possible, but there is enough evidence to show that even in the extreme cases the "normal theory" distribution of η^2 will give a very good practical approximation to the actual distribution found in sampling.

The following points are suggested by an examination of the tables.

(1) The deviations in Mean η^2 are not significant and do not appear to be systematic. For the leptokurtic populations, σ_{η^2} is probably significantly too large, and for the skew populations significantly too small*.

TABLE V (*b*).

5 *Groups of* 5.

Limits of η^2	Normal Theory Frequencies	Frequencies in Samples from Experimental Populations		
		(0·0, 7·1)	(0·5, 3·7)	(1·0, 3·8)
·00—·02	3·9 } 13·8	2 } 17	3 } 16	3 } 18
·02—·04	9·9	15	13	15
·04—·06	13·8	18	9	8
·06—·08	16·0	16	18	13
·08—·10	16·9	16	17	17
·10—·12	16·9	13	18	18
·12—·14	16·3	20	20	20
·14—·16	15·3	9	18	21
·16—·18	14·0	16	15	11
·18—·20	12·5	17	13	11
·20—·22	11·1	7	11	16
·22—·24	9·6	9	11	12
·24—·26	8·3	5	6	5
·26—·28	7·0	4	6	7
·28—·30	5·9 } 10·7	7 } 14	5 } 8	6 } 11
·30—·32	4·8	7	3	5
·32—·34	4·0 } 9·7	2 } 9	3 } 9	1 } 8
·34—·36	3·2	5	3	3
·36—·38	2·5	2	3	4
·38—·40	2·0 } 8·1	4 } 10	2 } 5	1 } 4
·40—·42	1·6	1	—	1
·42—·44	1·2	3	1	—
Greater than ·44	3·3	2	2	2
Totals	200·0	200	200	200
Mean η^2	·1667	·1636	·1579	·1608
σ_{η^2}	·1034	·1060	·0932	·0932
χ^2_5	—	13·98	6·64	14·66
P	—	·53	·97	·48

Standard Errors for 200 Series: of Mean η^2, ·0073; of σ_{η^2}, ·0061.

* The standard error of mean η^2 is $\sigma_{\eta^2}/\sqrt{M}$, where M is the number of sets of samples used. For the standard error of σ_{η^2} the approximation $\frac{1}{2}\sigma_{\eta^2}\sqrt{(_{\eta^2}\beta_2 - 1)/M}$ has been used, where the $_{\eta^2}\beta_2$ for equation (2) is taken from the equations (44) and (45) of *Biometrika*, Vol. XXI. p. 35.

TABLE V (*c*).

10 *Groups of* 5.

Limits of η^2	Normal Theory Frequencies	Frequencies in Samples from Experimental Populations			
		(0·0, 2·5)	(0·0, 4·1)	(0·0, 7·1)	(1·0, 3·8)
Less than ·04	0·5	1	3	3	—
·04—·06	1·9 } 13·0	2 } 15	2 } 15	2 } 14	1 } 11
·06—·08	4·1	3	7	4	5
·08—·10	6·5	9	3	5	5
·10—·12	8·6	10	7	9	10
·12—·14	10·0	13	11	9	5
·14—·16	10·6	14	6	10	16
·16—·18	10·5	8	12	17	19
·18—·20	9·7	7	10	5	9
·20—·22	8·6 } 15·8	4 } 16	9 } 15	3 } 9	10 } 13
·22—·24	7·2	12	6	6	3
·24—·26	5·9 } 10·5	6 } 7	4 } 8	5 } 14	7 } 9
·26—·28	4·6	1	4	9	2
·28—·30	3·5	1	5	6	1
·30—·32	2·6	2	4	2	2
·32—·34	1·8	2	3	1	—
·34—·36	1·3 } 11·3	1 } 10	1 } 16	— } 13	4 } 8
·36—·38	0·8	1	1	2	—
·38—·40	0·5	2	2	—	1
Greater than ·40	0·8	1	—	2	—
Totals	100·0	100	100	100	100
Mean η^2	·1837	·1774	·1852	·1848	·1772
σ_{η^2}	·0767	·0851	·0835	·0868	·0682
χ^2	—	5·20	5·52	10·89	14·39
P	—	·74	·70	·21	·07

Standard Errors for 100 Series: of Mean η^2, ·0077; of σ_{η^2}, ·0059.

(2) Too much weight must not be placed on the results of the χ^2 tests. The groupings used at the ends of the distributions are indicated in the tables by brackets, except in the case of the 20 groups of 2, Table V (*a*) and the 10 groups of 4, Table V (*d*)*. The total value of χ^2 from the Tables V is 93·54 contributed by 13 different series containing a total of 115 groups. Were the "normal theory" law truly applicable in all cases, the expected or mean value of χ^2 for such a combined test would be as great as $115 - 13 = 102$. The observed value of 93·54 is therefore no more than might be expected through chance. But the necessity of clubbing together the extreme tail groups when applying the tests has rendered these not very critical.

* In the first case 5 groups were used in the χ^2 test; $\eta^2 <$ ·40; ·40—·46; ·46—·52; ·52—·58; > ·58. In the second case 6 groups were used; $\eta^2 <$ ·14; ·14—·18; ·18—·22; ·22—·26; ·26—·32; > ·32.

TABLE V (*d*) AND (*e*).

(*d*) 10 *Groups of* 4. *Rectangular Population* (0·0, 1·8).

Limits of η^2	Normal Theory Frequencies	Experimental Frequencies
Less than ·08	1·4	2
·08—·12	4·0	6
·12—·16	6·8	3
·16—·20	8·3	8
·20—·24	8·4	12
·24—·28	7·2	5
·28—·32	5·5	4
·32—·36	3·8	7
·36—·40	2·3	—
·40—·44	1·2	2
Greater than ·44	1·1	1
Totals	50·0	50
Mean η^2	·2308	·2296
σ_{η^2}	·0931	·0928
χ^2	—	1·70
P	—	·88

(*e*) 10 *Groups of* 10. *Population* (0·5, 3·7).

Limits of η^2	Normal Theory Frequencies		Experimental Frequencies	
·00—·02	0·2	11·8	—	16
·02—·04	3·4		2	
·04—·06	8·2		14	
·06—·08	10·4		8	
·08—·10	9·7		5	
·10—·12	7·3		7	
·12—·14	4·8	10·8	6	14
·14—·16	2·9		6	
·16—·18	1·6		1	
·18—·20	0·8		—	
Greater than ·20	0·7		1	
Totals	50·0		50	
Mean η^2	·0909		·0930	
σ_{η^2}	·0405		·0429	
χ^2	—		5·29	
P	—		·26	

Standard Errors for 50 Series:

(*d*) of Mean η^2, ·0132; of σ_{η^2}, ·0098. (*e*) of Mean η^2, ·0057; of σ_{η^2}, ·0048.

(3) On comparing the detailed frequencies, we may observe the tendency noticed when examining σ_{η^2}, for too many high values of η^2 to occur when the population is leptokurtic and too few when it is skew. There also appear in several cases to be rather too many low values of η^2. This end of the distribution may sometimes be of importance, for in certain problems subnormal variation in the group means may be a feature requiring investigation.

(4) *A Comparative Case in which the Two Estimates of Variance are Essentially Independent.*

It is important to emphasise the fact that while in the problem we have considered the ratio of the two estimates of variance is not at all sensitive to changes in population form, this will not necessarily be the case in other problems. If two random samples of size n_1 and n_2, with variances s_1^2 and s_2^2, are randomly drawn from a parent *normal* population, and it is desired to test the hypothesis that the population variances are the same, we may calculate

$$x = n_1 s_1^2/(n_1 s_1^2 + n_2 s_2^2) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(23)$$

and refer to the sampling distribution of x if the hypothesis be true, namely to the Type I curve*,

$$df = \text{constant}\, x^{\frac{1}{2}(n_1-1)-1}(1-x)^{\frac{1}{2}(n_2-1)-1}\,dx \quad \ldots\ldots\ldots\ldots\ldots\ldots(24),$$

for which

$$\text{Mean } x = \frac{n_1-1}{n_1+n_2-2}, \qquad \sigma_x = \frac{1}{n_1+n_2-2}\sqrt{\frac{2(n_1-1)(n_2-1)}{n_1+n_2}} \quad \ldots(25).$$

If the variation be normal the situation is exactly similar to that of the η^2 test, equation (24) corresponding to equation (2). But when the variables are no longer normally distributed, the correspondence ceases. In one case the two estimates of variance remain independent, in the other they become correlated. To illustrate this consider the case of 5 groups of 5 observations dealt with experimentally above. Here $\theta(N-k)/(k-1) = 5\theta$ is the ratio of two estimates of σ^2, one based on 4 and the other on 20 degrees of freedom. If the population be normal the distribution of η^2 will correspond exactly to that of the x of (23) if $n_1 = 5$ and $n_2 = 21$. I had not available samples of 5 and 21, but had 500 pairs of samples of 5 and 20 from the six experimental populations, and in Table VI have given a summary comparison of observation and "normal theory." If this table be compared with Table V (*b*), the difference in the position will be seen at once. The theoretical distribution of x fails completely to represent the observed distributions in the case of the populations (0·0, 4·1), (0·0, 7·1) and (1·0, 3·8). This is brought out by a comparison of the

TABLE VI.

Two Independent Samples, $n_1 = 5$, $n_2 = 20$.

Frequencies in 500 pairs of Samples.

Limits for $x = \frac{n_1 s_1^2}{n_1 s_1^2 + n_2 s_2^2}$	Expected on Normal Theory	Observed in Experimental Sampling Populations					
		(0·0, 2·5)	(0·0, 4·1)	(0·0, 7·1)	(0·2, 3·3)	(0·5, 3·7)	(1·0, 3·8)
x less than ·02	8·9	4	15	18	8	13	17
" " ·04	31·8	28	47	60	29	45	50
x greater than ·38	24·3	15	40	51	37	25	41
" " ·48	5·4	2	17	20	10	6	13
" " ·56	1·1	1	7	9	5	2	3
Mean x	·1739	·1734	·1715	·1779	·1823	·1684	·1778
σ_x	·1072	·0973	·1262	·1418	·1185	·1090	·1240
χ^2 (using 21 groups)	—	21·44	51·31	86·91	20·57	13·17	52·21
P	—	·372	·0002	$<$·0001	·423	·869	·0002

Standard Errors for 500 pairs of samples: of Mean x, ·0048; of σ_x, ·0040.

* This is a modified form of R. A. Fisher's test, see *Statistical Methods for Research Workers*, pp. 194—196.

standard deviations; it will be seen that in passing from symmetrical platykurtic to symmetrical leptokurtic forms, σ_x changes from a value 10 °/₀ below "normal theory" to 30 °/₀ above*. Also the value in the case of (1·0, 3·8) differs from the theoretical σ_x by over 4 times the standard error. For the less extreme populations (0·0, 2·5), (0·2, 3·3) and (0·5, 3·7) the fit is more reasonable.

Further investigation is required to ascertain more precisely the limits of sample size and population form within which the test may be safely used; but the illustration should serve to emphasise the fact that certain of the "normal theory" tests can be used with greater confidence than others when dealing with samples from populations whose distribution laws are not certainly known.

(5) *The more Complex Problems in the Analysis of Variance.*

In the test that has been discussed, which was illustrated on the problem of Table I, we allow for the presence of a single factor, A, whose contribution, a_x, to y varies from group to group. That is to say, if $y_{t,x}$ be the tth observation in the xth group we suppose

$$y_{t,x} = a_x + Y_{t,x} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(26),$$

where $Y_{t,x}$ is a random variation, and a_x is constant for all individuals in the xth group. And the method of investigation has consisted in testing the hypothesis that a_x does not vary with x, i.e. that the group means are not in fact differentiated.

In the more complex problems it is supposed that y is subject to a random term and to the sum of a number of terms due to different factors A, B, C, etc., so that

$$y_{t.x,y,z,\ldots} = a_x + b_y + c_z + \ldots + Y_{t.x,y,z} \quad \ldots\ldots\ldots\ldots\ldots\ldots(27).$$

The exact values of a_x, b_y, etc. are not known, but the factors, if present, are to some extent under control so that we can collect a group of $n_{x,y,z,\ldots}$ observations all of which must contain the same value of a_x due to the A factor, the same value of b_y to the B factor, and so on.

There are a variety of problems in which the situation can be pictured as represented approximately in this manner. In addition to those in agricultural plot experimentation in connection with which the technique was first developed by R. A. Fisher, Tippett has for example recently applied the method in problems of textile research†. The essential idea in the process of analysis is to group the observations in such a way that it is possible to test separately for the presence of an A factor, a B factor, etc. This is done by obtaining in each case two estimates of the unknown variance, σ^2, of the residual term Y, which would differ only through chance fluctuations if that particular factor were either without influence or made the same contribution to every group.

It is not possible to enter here into the details of the method, but corresponding to the equations (5) and (6), the estimates may be written as proportional to two

* A similar trend is very clearly apparent in other cases I have examined, viz. $n_1=5=n_2$; $n_1=5$, $n_2=10$; $n_1=10$, $n_2=20$.

† L. H. C. Tippett, "Statistical Methods in Textile Research." *Shirley Institute Memoirs*, Vol. VIII. 1929.

quantities h and q, the first based on f_1 degrees of freedom, the second on f_2*. As long as the variation of the residual terms, Y, is normal and independent of the factors A, B, etc., these two estimates are independent, and each is distributed according to a Type III law, giving a Type VI law for the sampling distribution of their ratio. But such will not be exactly true if the variation in Y be not normal. Taking the case where the analysis is arranged to test for the presence of two factors, A and B, and where $n_{x,y}$ is constant for all combinations of x and y†, it is possible to show by an extension of the methods which lead to equations (7), (8), (13), (14) and (15), that

$$\left.\begin{aligned} \bar{h} &= f_1; \qquad \bar{q} = f_2 \\ \sigma_h^2 &= 2f_1\{1 + \tfrac{1}{2}(\beta_2 - 3) f_1/N\}; \quad \sigma_q^2 = 2f_2\{1 + \tfrac{1}{2}(\beta_2 - 3) f_2/N\} \\ r_{hq}\sigma_h\sigma_q &= (\beta_2 - 3) f_1 f_2/N \end{aligned}\right\} \quad \text{.....(28),}$$

in which β_2 refers to the distribution of Y. Following the same procedure as in equations (16) to (19), we obtain for $\theta = h/q$,

$$\text{Mean } \theta = \frac{f_1}{f_2}\left\{1 + \frac{2}{f_2} + \ldots\right\}; \qquad \sigma_\theta^2 = \frac{2f_1(f_1 + f_2)}{f_2^3} + \ldots \quad \text{.....(29),}$$

or to this order of approximation, Mean θ and σ_θ will be independent of β_2. These results could probably be generalised to apply to the analysis employed when more than two factors are present, and they suggest that in all such cases the distribution of θ may not be very sensitive to changes in population form. But how far this approximation will really represent the situation in cases where as often in practice f_2 is a small number, it is not at present possible to say.

(6) *Summary.*

(i) The main problem which has been considered is that encountered in the simplest form of arrangement for the analysis of variance; it is the same problem as that of testing the significance of η^2. In practice the worker may either know that the variation in his populations is not exactly normal, or it may be that he has no means of being certain of the precise form of this variation at all. He therefore needs to feel some confidence that the test which he applies will not be invalid provided that the deviation from normality is not extreme.

(ii) There is no doubt that in such cases the sampling distribution of η^2 if expressed in exact mathematical form would be found to differ from the "normal theory" law. But in practical statistics measures of probability are usually not required on a very fine scale, and the results of this paper suggest that within the range of the experimental populations indicated in Fig. 1, η^2 is adequately represented for very many purposes by this law.

(iii) This will mean that in applying the test we shall not be liable to make unexpected errors by rejecting the hypothesis of a common origin of the groups, when in fact it is true. But in the more extreme cases of non-normal variation,

* In the simple problem discussed $f_1 = k - 1$, $f_2 = N - k$.

† This condition is not in fact very limiting as experiments will generally be arranged in this form.

where the standard deviation becomes an unsatisfactory measure of variability, there will always be a danger of accepting the hypothesis when some more efficient test (yet to be devised!) would enable us to pick out a real difference.

(iv) The case in which the variation changes from one group to another has not been considered here.

(v) The problem of testing the significance of the difference in the variances of two independent samples must be distinguished from that dealt with. The sampling distributions of the criteria are only the same when the variation is normal. This other test has been found in small samples to be considerably more sensitive to changes in population form than is the η^2 test.

(vi) It seems probable that the more elaborate forms of analysis of variance are also of fairly wide application, provided that the number of degrees of freedom apportioned to the residual variation is not too small.

I should like again to thank Mrs L. J. Comrie for her very efficient performance of the greater part of the computing; also for their share in the calculating or sampling, Miss Augusta Jones, Mr Ernest Martin and Mr A. E. Stone; for Fig. 1, Mrs F. Larmor, and for Figs. 2 and 3, Miss E. Irvine.

A STUDY OF THE DISTRIBUTION OF THE VARIANCE IN SMALL SAMPLES.

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PART I.

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1. *Historical Summary.*

In 1889 Thiele* gave formulae for the first three semi-invariants of the second semi-invariant in repeated samples from any population. In 1903† he added the expression for the fourth semi-invariant. From these results, as shown by Rider, the first four moments of the sampling distribution of the variance can be obtained‡.

In 1908 "Student§," having obtained independently the first four moments in the case of the normal population, showed that they satisfied the condition for a Type III curve. On the assumption that the distribution curve for variance was actually Type III, he deduced a distribution curve for the standard deviation, which was subsequently proved by Fisher to be the true theoretical law‖.

Later, Tchouproff¶ gave general formulae for moments of moments, and he deduced the first four moments of the variance as a special case.

In 1925 Church** showed how the moments could be obtained by extending "Student's" shorter and more direct method. He then carried out an experimental

* *Forelæsninger over Almindelig Iagttagelseslære.* Copenhagen, 18.

† *Theory of Observations*, p. 42.

‡ "Moments of Moments," *Proceedings of the National Academy of Sciences*, Vol. xv. No. 5, pp. 430—434, 1929.

§ "The Probable Error of a Mean," *Biometrika*, Vol. vi. p. 1.

‖ *Biometrika*, Vol. x. p. 507. [Helmert obtained this curve in 1876: see "Historical Note" in the present issue. Ed.]

¶ "On the Mathematical Expectation of the Moments of Frequency Distributions," *Biometrika*, Vol. xii. pp. 193—194.

** "On the Moments of the Distribution of Squared Standard Deviations for Samples of N drawn from an Indefinitely Large Population," *Biometrika*, Vol. xvii. p. 79.

investigation* which is important as the first attempt to make use of the theoretical moments of the variance to obtain frequency curves to represent the sampling distribution. He found that these moments, as obtained from the known moments of the sampled population, led to Pearson frequency curves, which adequately described his actually observed distributions. But he had occasion to deal with only two sampled populations; these were almost equally skew, and were discussed only for samples of ten.

"Sophister†" followed up Church's work by adding the results of sampling experiments on another, and definitely skewer population. He discussed samples of five and twenty, and from the theoretical moments obtained Pearson curves which were in satisfactory agreement with his observed distributions. He fixed the start of his theoretical curves at the true point of zero variance. This is a very natural procedure, and, as explained by him, if a Pearson curve be used, only requires the use of the first four betas of the sampled population. The advantages of this method, and an extension of it to cover limited range distributions, will be discussed more fully at a later stage, and will be tested on experimental data in Part II.

The present part deals only with a numerical and graphical analysis of the formulae for the moments of the variance, without having regard to any one particular population. In Part II the results of six further sets of sampling experiments will be added to those of Church and "Sophister"; the latter's population will be considered for samples of ten, thus giving in all nine sets of experimental results. The methods developed in the present part will also be tested on Church's results for one of his populations.

The Type III sampling distribution of the variance, appropriate for a normal population, has formed the basis of a number of statistical tests of considerable practical importance. It is not the object of this paper to discuss whether or not similar tests can be developed for use with non-normal material, but it is clear that an essential preliminary to further research is a fuller knowledge of the form of these basic sampling curves of variance. This has been the general object of the present paper. It has been possible not only to trace out the manner in which the variance curves alter as the population and sample size alter, but also to show how, if the moments of the sampled population be known, these distributions may be adequately represented by certain Pearson curves.

2. *Notation and the Tabling of B_1 and B_2.*

I shall use the following notation. "The sampled population" will be denoted by $P(\beta_1, \beta_2)$ when its β_1 and β_2 are specified, but will be referred to simply as the "parent population" when its betas are unspecified. "The sampling distribution of the variance" will be expressed by $D(s^2)$; s^2 will denote the variance of a sample

* "On the Means and Squared Standard Deviations of Small Samples from any Population," *Biometrika*, Vol. XVIII. p. 321.

† "Discussion of Small Samples Drawn from an Infinite Skew Population," *Biometrika*, Vol. XX^A. p. 389.

of size n; N the number of such samples; M_1' the first moment coefficient about the origin; M_2, M_3 and M_4 the three moment coefficients of $D(s^2)$ about its mean; and $V_2 = \sigma^2$ the parent population variance. Similarly B_1 and B_2 will refer to $D(s^2)$ and β_1, β_2, β_3, β_4 and β_6 to the parent population. We shall also write σ_{s^2} for $\sqrt{M_2}$.

When starting this investigation I intended, at Professor Karl Pearson's suggestion, to compute fairly extensive tables giving the betas of $D(s^2)$ for a wide range of populations. With this purpose in view the variance moment formulae were written in the following forms:

$$M_1' = V_2(n-1)/n \quad \ldots\ldots(1),$$

$$M_2 = \frac{V_2^2}{n}\left(1-\frac{1}{n}\right)^2\left[\beta_2 - 1 + \frac{2}{n-1}\right] = \frac{V_2^2}{n}\left(1-\frac{1}{n}\right)^2 A \quad \ldots\ldots(2),$$

where A is the factor in squared brackets.

$$M_3 = \frac{V_2^3}{n^2}\left(1-\frac{1}{n}\right)^3\left[\beta_4 - \left\{3\left(1-\frac{4}{n-1}\right)\beta_2 + 2\left(3+\frac{2}{(n-1)^2}\right)\beta_1 - 2\left(1-\frac{10}{n-1}+\frac{4}{(n-1)^2}\right)\right\}\right]$$

$$= \frac{V_2^3}{n^2}\left(1-\frac{1}{n}\right)^3[\beta_4 - B] \quad \ldots\ldots(3),$$

where B represents the term in curled brackets.

$$M_4 = \frac{V_2^4}{n^3}\left(1-\frac{1}{n}\right)^4\left[\beta_6 - 4\left(1-\frac{6}{n-1}\right)\beta_4 - 8\left(3+\frac{4}{(n-1)^2}\right)\beta_3 + \left\{\left(3(n-1)+\frac{24}{n-1}+\frac{8}{(n-1)^3}\beta_2^2\right)\right.\right.$$

$$- 6\left((n-4)+\frac{34}{n-1}-\frac{24}{(n-1)^2}+\frac{8}{(n-1)^3}\right)\beta_2$$

$$+ 16\left(6-\frac{9}{n-1}+\frac{14}{(n-1)^2}-\frac{6}{(n-1)^3}\right)\beta_1$$

$$\left.\left. + 3\left((n-6)+\frac{72}{n-1}-\frac{92}{(n-1)^2}+\frac{40}{(n-1)^3}\right)\right\}\right]$$

$$= \frac{V_2^4}{n^3}\left(1-\frac{1}{n}\right)^4\left[\beta_6 - 4\left(1-\frac{6}{n-1}\right)\beta_4 - 8\left(3+\frac{4}{(n-1)^2}\right)\beta_3 + C\right] \quad \ldots(4),$$

where C = the sum of the four terms contained in the curled brackets.

Hence $B_1 = \dfrac{(\beta_4 - B)^2}{nA^3}$ and $B_2 = \dfrac{\left\{\beta_6 - 4\left(1-\dfrac{6}{n-1}\right)\beta_4 - 8\left(3+\dfrac{4}{(n-1)^2}\right)\beta_3 + C\right.}{nA^2}$.

The method of calculation was as follows:

(i) The size of the sample was decided upon and substituted in the above formulae.

(ii) Preliminary tables of A, nA^2, nA^3, B and C were computed by differencing and using Barlow's Tables.

(iii) Finally the values of β_6, β_4 and β_3 were taken from Yasukawa's paper*, and the values of B_1 and B_2 calculated.

In this way twelve complete tables of B_1, and the corresponding preliminary tables for B_2 were calculated for all populations within the field bounded by the lines $\beta_2 - \beta_1 - 1 = 0$, $\beta_1 = 0$, $\beta_2 = 5$ and $\beta_1 = 1{\cdot}5$, the variables β_1 and β_2 increasing by intervals of 0·1 and the sizes of the samples selected being 2, 3, 4, 5, 10, 15, 20, 30, 40, 50, 75 and 100. These calculations occupied seven months of strenuous labour.

When, however, at a later stage of this investigation I turned to experimental work there appeared to be certain advantages in fitting variance curves, not from the tabled values of B_1 and B_2, but by fixing the start of such curves; using only the first three moments, and determining the constants $\gamma_1 = M_2'/(M_1')^2$ and $\gamma_2 = M_2'/(M_2' M_1')$ directly from the population β_1, β_2 and β_4; dashes denoting moments about an origin at the start of the curve. This method will be considered fully at a later stage.

Nevertheless, I could use my tables in order to form a sort of mental picture as to how the betas of $D(s^2)$ are affected by the size of the sample and the betas of the sampled population. This problem is considered in the next section.

3. *Graphical Representation of the Variations in B_1 and B_2.*

As established by "Student†," when the population is normal, $D(s^2)$ is a Type III curve, and the point representing the distribution in the (B_1, B_2) fields tends to the Normal Point (0, 3) along the straight line $2B_2 - 3B_1 - 6 = 0$ as n increases. In the general case of non-normal populations the formulae (2)—(4) enable us to show that the (B_1, B_2) point representing a particular $D(s^2)$ also converges on (0, 3) as n increases, but along a *curved* path‡. The form of path depends upon the values of β_1, β_2, β_3, β_4 and β_6. The populations of experience will provide an infinite variety of combinations of such values, but in the theoretical discussion below we shall confine our attention to distributions which are represented by Pearson curves, i.e. for which β_3, β_4 and β_6 are special functions of β_1 and β_2, viz. those given by the well-known difference formulae§.

Practical experience has shown that Professor Pearson's system of curves will provide a satisfactory approximation to a very great variety of observed population forms. It follows that for such curves B_1 and B_2 are functions of β_1, β_2 and n only and we shall have in the (B_1, B_2) field for each $P(\beta_1, \beta_2)$ a separate curve converging on the point (0, 3) as n increases indefinitely. I have prepared from my tables of B_1 and B_2 a series of such curves shown in Diagrams I—IV. Each curve corre-

* "On the Probable Error of the Mode of Skew Frequency Distributions," *Biometrika*, Vol. XVIII. pp. 268—275.

† [Established by Helmert, later again suggested by "Student," and independently deduced by Fisher some forty years later. ED.]

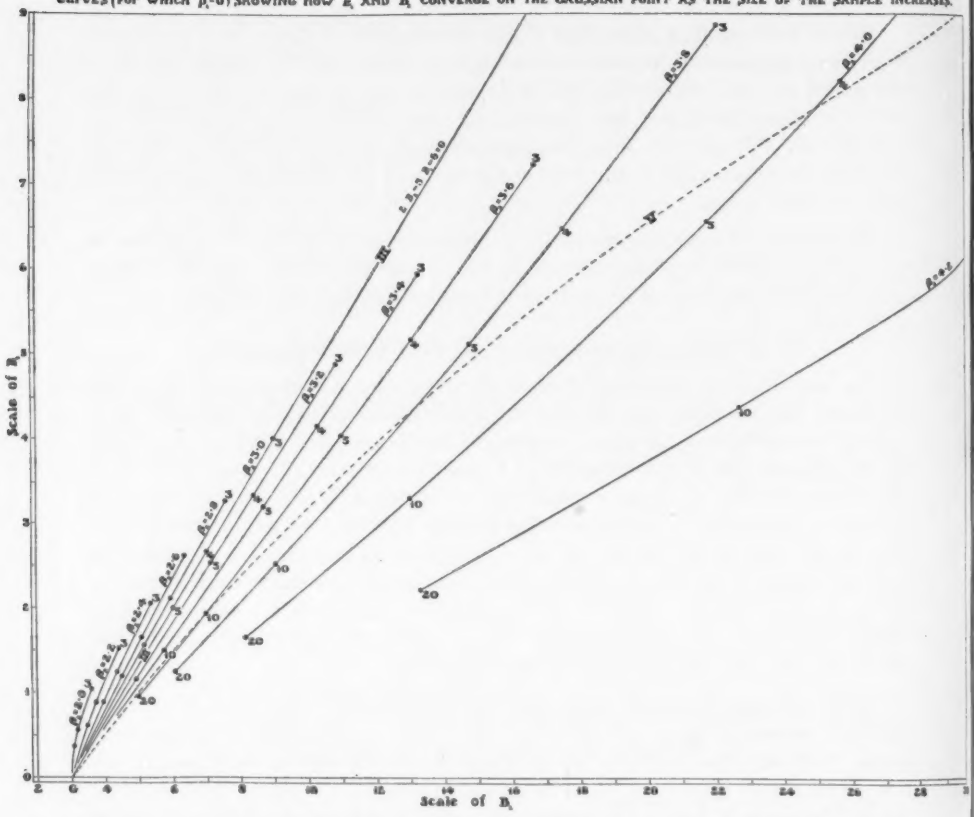
‡ Cf. the way in which the beta point for the *Means* converges on (0, 3) along *straight* lines. In *Biometrika*, Vol. XVIII. p. 339, Church gives a diagram illustrating this fact.

§ *Tables for Statisticians and Biometricians*, Part I, p. 41.

sponds to a different population, and the spots indicate the (B_1, B_2) values associated with the size of sample, n, indicated by the small accompanying number. Diagrams I and IV illustrate the case of a set of symmetrical populations with β_2 ranging from 1·0 to 4·2; Diagram II shows that of a set of populations all having $\beta_1 = 0{\cdot}6$, and β_2 ranging from 2·6 to 5·0; and lastly Diagram III refers to a third set of populations for which $\beta_1 = 1{\cdot}2$, and β_2 ranges from 3·2 to 6·0. In the neighbourhood of

DIAGRAM I.

CURVES (FOR WHICH $\beta_1 = 0$) SHOWING HOW b_1 AND B_1 CONVERGE ON THE GAUSSIAN POINT AS THE SIZE OF THE SAMPLE INCREASES.



the normal point (0, 3), some circles and numbers are omitted for clearness. In Diagrams I, II and III the lines are continued as far as $n = 20$, $n = 40$, $n = 50$ respectively. The sample size does not, of course, vary continuously, but the lines have been so drawn in all four diagrams merely to guide the eye. The same remark holds in the case of Diagram V to which I shall refer later.

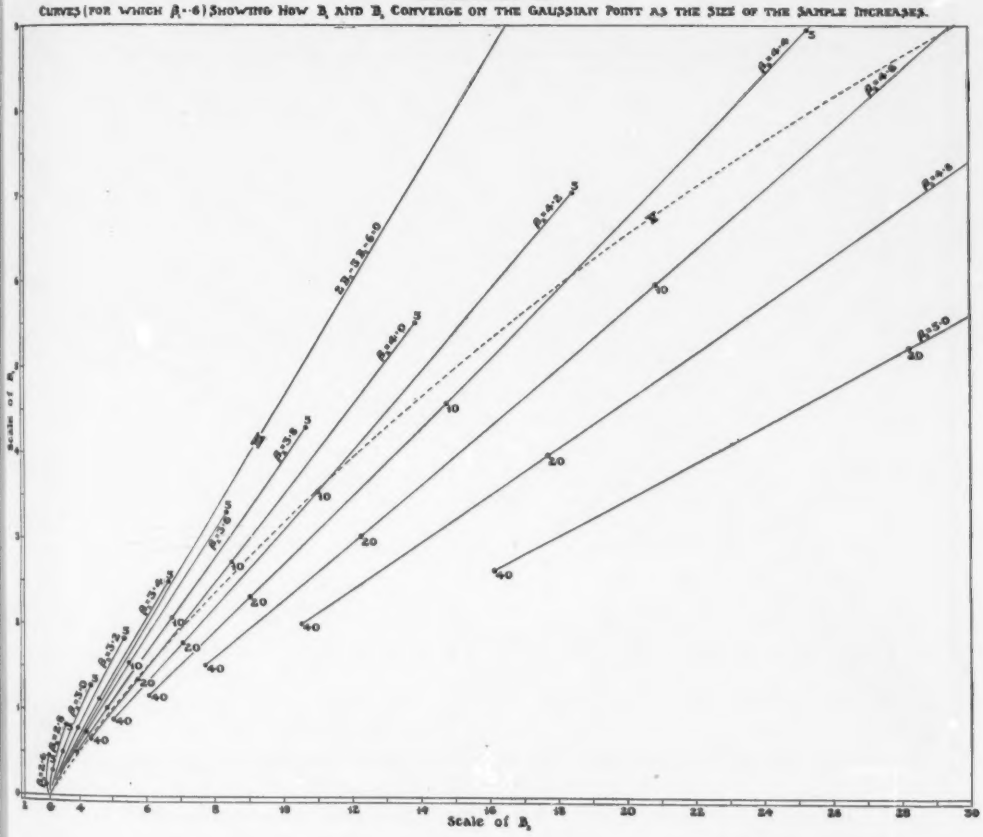
Diagrams I, II and III have been drawn on exactly the same scale, the second and the third being reproduced as tissues (in pocket at end of volume) so that any

one of them can be fitted on top of the first for purposes of comparison. By such a comparison the following points may be roughly tested:

First it will be observed that the three systems of curves do not show any abrupt crossings; they tend in fact to converge towards the Gaussian point without cutting, this being especially so in the neighbourhood of the Type III line where they are nearly straight. This means that if two converging lines corresponding to

DIAGRAM II.

CURVES (FOR WHICH $\beta_1 = 6$) SHOWING HOW β_1 AND β_2 CONVERGE ON THE GAUSSIAN POINT AS THE SIZE OF THE SAMPLE INCREASES.



two different parent populations are close together at any one point and are not far from the Type III line, they will remain relatively close together throughout their length. Secondly, a comparison will show that for a given β_2 and a given n, the deviations from normality of $D(s^2)$ decrease with increasing β_1. This is expressed otherwise by saying that an increase in β_1, *ceteris paribus*, tends to shift $D(s^2)$ from the Type IV field into Type VI, or from the latter into Type I.

Any one of the three diagrams, considered separately, will show that: (i) for a given β_1 and a given n, the deviations from normality of $D(s^2)$ increase with β_2; (ii) there may or may not be a change of type in $D(s^2)$ for different sizes of samples from a given parent population. For this and other reasons the Type III and Type V lines are shown in the diagrams.

DIAGRAM III.

CURVES (FOR WHICH $\beta_1 = 1{\cdot}2$) SHOWING HOW B_1 AND B_2 CONVERGE ON THE GAUSSIAN POINT AS THE SIZE OF THE SAMPLE INCREASES.

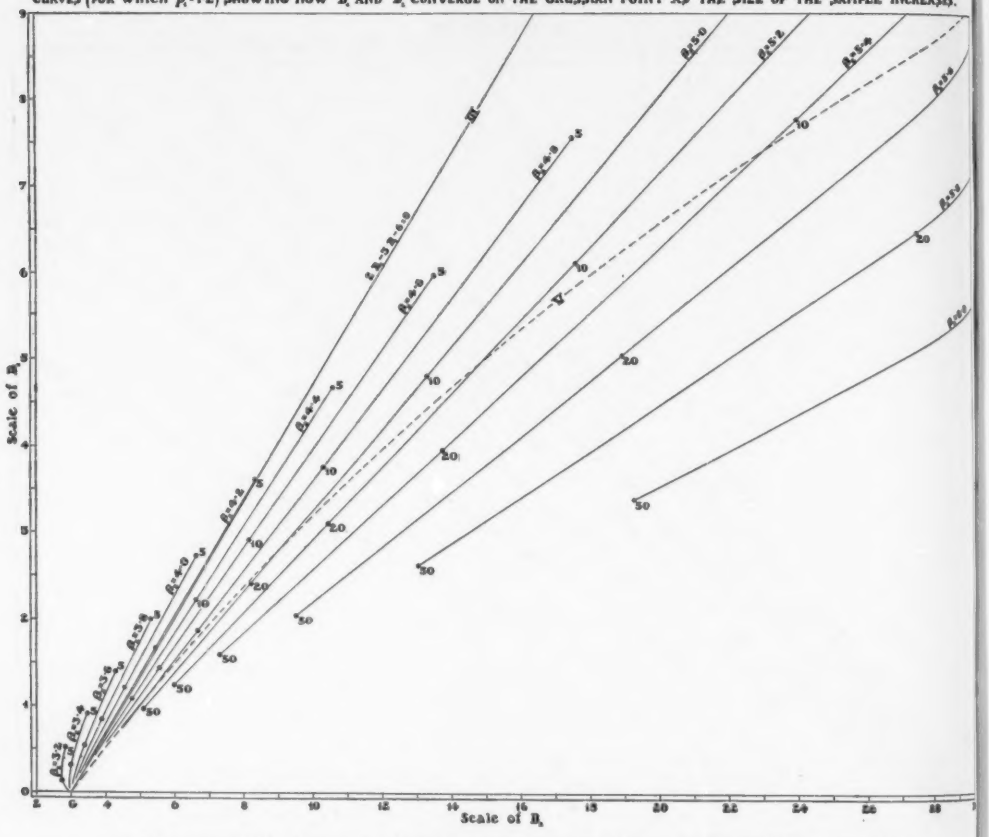


Diagram IV is given to show that curious variations in B_1 and B_2 occur for a number of U-* and J-shaped Type I parent populations. It illustrates the case only of symmetrical parent populations, but the same sort of exceptional variations are found for definitely skew populations. The arrows in this diagram indicate the

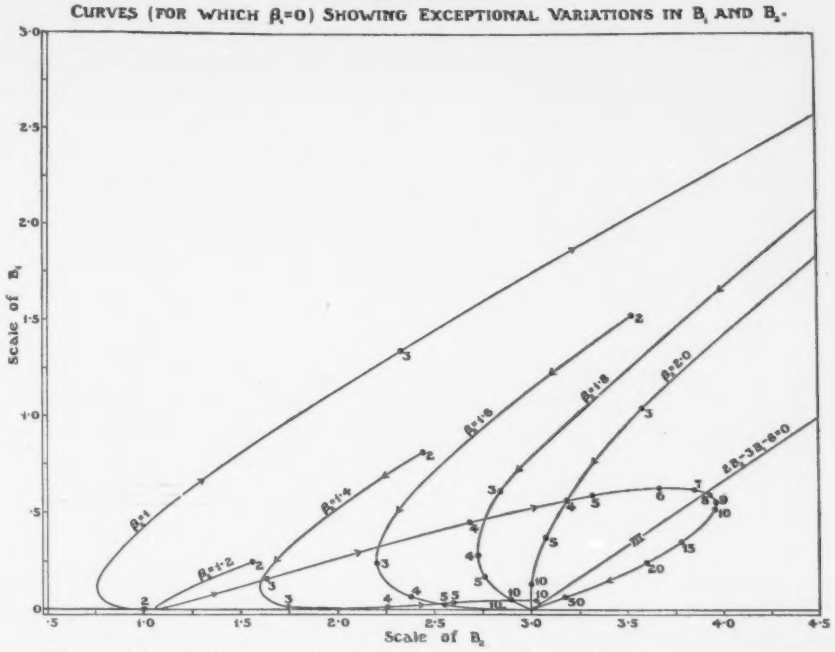
* [The paper by Holzinger and Church (*Biometrika*, Vol. xx^A. p. 261) has shown that *small* samples from U-shaped curves will give multi-modal frequency distributions for their means—curves very different from uni-modal Pearson curves. It may therefore be doubted whether it is possible to give (in the case of the variance also) any meaning to these B_1, B_2 curves in Diagram IV, for samples under 40 or 50, since B_1, B_2 have been obtained from the difference-formulae for Pearson uni-modal curves. ED.]

direction in which the size of the sample increases. The line marked $\beta_2 = 1$ represents a parent population in which the variable can only assume one of two alternative values. For this population the betas of $D(s^2)$ continually increase, and the line in the figure tends to the point $B_1 = 8$, $B_2 = 15$ as n increases indefinitely, i.e. a point lying on the Type III line.

The line marked $\beta_2 = 1{\cdot}2$ illustrates a case where for a given population the size of the sample alone alters the form of $D(s^2)$ from different shapes of Type I to Type VI and even to Type IV.

DIAGRAM IV.

CURVES (FOR WHICH $\beta_1 = 0$) SHOWING EXCEPTIONAL VARIATIONS IN B_1 AND B_2.



The plotting of the curve for $P(0, 1{\cdot}4)$—a symmetrical U curve—brought out the fact, not shown in the diagram, that for values of n between 10 and 50 the Type III line is cut twice. The table below shows that this is so.

$P(0, 1{\cdot}4)$			
n	B_1	B_2	$2B_2 - 3B_1 - 6$
10	·04421	3·02604	− ·08055
15	·02759	3·04312	+ ·00347
20	·01806	3·03052	+ ·00686
50	·00404	2·99697	− ·01818

For $\beta_2 = 1{\cdot}6$, or higher values, the lines in Diagram IV already change over to the more general form of those in Diagrams I—III.

Finally, Diagram IV shows that the betas of $D(s^2)$ may pass through maxima and minima while tending to normality for increasing n.

4. *Type I and Type VI Distributions of Variance.*

On p. 402 of the paper already referred to "Sophister" writes: "If we assume the frequency curve of variance to be limited at one end only of the range, then curves of Type III, Type V and Type VI are possible distributions. But as Types III and V are only limiting cases of Type VI it will be sufficient to consider Type VI as a possible curve for the distribution of variance in samples. Thus far in sampling experiments—and with considerable range in size of samples—Type VI has repeatedly occurred. Even when the β's of the observed samples fell into the area of Type IV it has been found that the β's of the variance curve, as calculated from Church's values of the moments of the variance distribution, lie within the Type VI area, and the observed β's lying within the Type IV area only differed from the theoretical β's by quantities of the order of the probable errors, which in this neighbourhood may be considerable. Curves, however, of Type VI, fitted from the theoretical β's, gave quite reasonably good fits to the observations." He accordingly assumed that the distribution of s^2 in samples could be represented by a Type VI curve; he made the curve start at $s^2 = 0$ and wrote it in the form $y = y_0 \mu_2^{q_2} (\mu_2 + a)^{-q_1}$ with the range from $\mu_2 = 0$ to $\mu_2 = \infty$. Expressions for q_1 and q_2 were given in terms of two quantities γ_1 and γ_2 defined by $\gamma_1 = M_2'/M_1'^2$ and $\gamma_2 = M_3'/(M_2' M_1')$. He fitted the curve to two experimental distributions—samples of 5 and 20—from a Type III parent population $P(0{\cdot}5, 3{\cdot}7\dot{5})$.

This method of obtaining an approximation to $D(s^2)$ by fixing the start of the curve, and its first three moment coefficients, has several advantages over the alternative method of using the first four moment coefficients, and paying no regard to the start. In small samples, where low values of s^2 may be expected, it is clearly important that the curve should start correctly; in addition, the first method has the advantage, both theoretical and practical, of introducing only the population β_1, β_2 and β_4, while for the second method β_3 and β_6 are also required. In "Sophister's" case the curves with fixed start fitted the experimental results somewhat better than those based on the four moments. But it must be remembered that he tested his curves in the case of only one population, and for two sizes of samples; and further in both cases his fixed start and non-fixed start curves were of Type VI, so that the method involved no change of type. Our Diagrams I—III have shown that the appropriate Pearson curves given by the four-moment fit may also be of Type I and Type IV; in the latter case the three-moment fixed start fit would alter the type, and the question arises whether in such cases the fixed start curves will still be adequate. It is clear, however, that for the fixed start curves we must be prepared to consider Type I as well as Type VI, with Type III as a special case. We shall first discuss the process of fitting, and the methods of obtaining the

probability integrals of the resulting curves, while in Part II the adequacy of the methods suggested will be tested on experimental data.

Accordingly we shall assume that $D(s^2)$ is given either by a Type VI curve of the form

$$y = y_0 (s^2)^{m_2} (s^2 + a)^{-m_1} \quad \ldots\ldots(5),$$

with unlimited range from $s^2 = 0$ to s^2 tending to ∞, or by a Type I curve of the form

$$y = y_0 (s^2)^{m_2} (b - s^2)^{-m_1} \quad \ldots\ldots(6),$$

with limited range $s^2 = 0$ to $s^2 = b$.

These two curves can be expected to cover the greater number of distributions of variance. We are changing "Sophister's" q_1 and q_2 to m_1 and m_2, using the same letters in the two cases, for obvious reasons. His expressions for q_2, q_1, a and y_0 will now be written

$$m_2 + 1 = \frac{2(\gamma_1 - \gamma_2)}{2\gamma_2 - \gamma_1\gamma_2 - \gamma_1} \quad \ldots\ldots(7), \qquad m_1 - m_2 - 2 = \frac{2(\gamma_1 - \gamma_2)}{2\gamma_1 - \gamma_2 - 1} \quad \ldots\ldots(8),$$

$$a = \frac{m_1 - m_2 - 2}{m_2 + 1} \cdot M_1' \quad \ldots\ldots(9),$$

$$y_0 = \frac{a^{m_1 - m_2 - 1}\,\Gamma(m_1)}{\Gamma(m_2 + 1)\,\Gamma(m_1 - m_2 - 1)} \quad \ldots\ldots(10),$$

the area under the curve being taken as unity.

Turning now to our limited range $D(s^2)$ of Type I we have

$$N M_k' = y_0 \int_0^b (s^2)^{m_2 + k} (b - s^2)^{-m_1} ds^2,$$

where M_k' is the kth moment coefficient about an origin at the start of the curve. Writing $Z = \frac{s^2}{b}$, we find

$$N M_k' = y_0 b^{k+1-m_1+m_2} \int_0^1 Z^{m_2+k} (1 - Z)^{-m_1} dZ,$$

i.e.
$$N M_k' = y_0 b^{k+1-m_1+m_2} B\{(m_2 + k + 1), (1 - m_1)\}.$$

Taking k successively equal to 0, 1, 2 and 3; remembering that $\gamma_1 = M_2'/M_1'^2$ and $\gamma_2 = M_3'/(M_2' M_1')$; and solving for m_1 and m_2 we find

$$m_2 + 1 = \frac{2(\gamma_1 - \gamma_2)}{2\gamma_2 - \gamma_1\gamma_2 - \gamma_1} \quad \ldots\ldots(7)\,bis, \qquad m_1 - m_2 - 2 = \frac{2(\gamma_1 - \gamma_2)}{2\gamma_1 - \gamma_2 - 1} \quad \ldots\ldots(8)\,bis,$$

$$b = \frac{(m_2 - m_1 + 2)}{m_2 + 1} \cdot M_1' \quad \ldots\ldots(11),$$

$$y_0 = \frac{\Gamma(m_2 - m_1 + 2)}{b^{(m_2 - m_1 + 1)}\,\Gamma(m_2 + 1)\,\Gamma(1 - m_1)} \quad \ldots\ldots(12),$$

the area under the curve being again reckoned as unity.

This means, therefore, that m_1 and m_2 are calculated from γ_1 and γ_2 in exactly the same way in the two cases of Type VI and Type I curves with fixed starts*.

* [The fact that Type VI can have its constants determined by the same equations as Type I was stated by Pearson in *Phil. Trans.* Vol. 193A, 1901, p. 449. The equations for the constants for Type I when the start of the curve is fixed were given by him in 1894, *Phil. Trans.* Vol. 186A, p. 371, and the like equations for Type VI in *Phil. Trans.* Vol. 193A, 1901, p. 450. They have been frequently used since in the Biometric Laboratory. ED.]

Let us write briefly for the curves of equations (5) and (6), VI (F)—Type VI, fixed start, three moments; and I (F)—Type I, fixed start, three moments, respectively. In cases where the equations have been obtained using the four-moment fit, and not fixing the start, we shall use the notation VI (N.F) and I (N.F). As IV (F) is impossible no distinction is necessary here, but we shall use III (F) and III (N.F).

The procedure to adopt in obtaining the appropriate fixed start curve may be summarised as follows:

(1) Find γ_1 and γ_2 from "Sophister's" equations*:

$$\gamma_1 = \frac{n+1}{n-1} + \frac{1}{n}(\beta_2 - 3) \quad \text{.....(13),}$$

$$\gamma_1\gamma_2\dagger = \frac{(n-1)(n+3)}{(n-1)^2} + \frac{\beta_4 - 15}{n^2} + \frac{3}{n-1}\left(\frac{n^2-2n+5}{n^3}\right)(\beta_2 - 3) - \frac{2}{(n-1)^2}\frac{(3n_2 - 6n + 5)}{n_2}\beta_1 \quad \text{...(14).}$$

(2) Calculate $m_1 - m_2 - 2 = \dfrac{6(B_2 - B_1 - 1)}{2B_2 - 3B_1 - 6} = \dfrac{2(\gamma_1 - \gamma_2)}{2\gamma_1 - \gamma_2 - 1}$.

(3) If $m_1 - m_2 - 2$ be negative, the curve will be I (F) and equations (6), (7) *bis*, (8) *bis*, (11) and (12) are to be used.

If $m_1 - m_2 - 2$ be positive, the curve will be VI (F)‡, and equations (5), (7), (8), (9) and (10) are to be used.

The present section is, of course, based on the assumption that our fixed start curves, fitted from three moments, are useful and adequate for describing frequency

* *Biometrika*, Vol. xx[A]. p. 404. [The origin of these equations is indicated by "Sophister" on p. 399. Ed.]

† The equation is written in this form because the value of the product $\gamma_1\gamma_2$ is also needed in (7) or (7) *bis*.

‡ ["Sophister" was using a parent population of Type III and accordingly from the *theoretical* standpoint a Type I curve would be impossible, as s^2 is not limited. When the parent population has a limited range, then Type VI is theoretically inappropriate because the possibilities of s^2 are really limited. In actual graduation of the distribution of s^2, however, we have to remember that we can only represent our continuous parent population for sampling purposes by discontinuous groups and accordingly such systems cannot give unlimited s^2 distributions. It is only when the sample is considerable that the experimental s^2 distribution itself will cease to be a discontinuous system. But for considerable samples s^2 can never in practice be zero, and low values may even be of vanishingly small improbability. In such cases it may be as convenient to graduate s^2 by a curve not starting at $s^2=0$, as to describe stature in man by the theoretically impossible normal curve. The Pearson types pass insensibly one into the other, and there need be little surprise if a theoretically impossible curve for s^2, i.e. one with s^2 unlimited both-ways, be found to arise in large samples from a both-ways limited parent population.

With regard to fixed or free start, a large experience of curve fitting for graduation purposes during the past forty or more years in the Biometric Laboratory seems to indicate that the choice should depend on the closeness of the mode to the theoretical start. If values of the variate near that start are excessively improbable then fitting by four moments will usually give the better fit. If they are comparatively frequent then fitting by the start and three moments will be superior. In the present case of the distribution of s^2 this would suggest that for samples of 30 and upwards the four-moment fit is likely to be the better, for small samples of 10 and under, than the fixed start. It is, however, for such small samples, especially from fixed range parent populations, that one may reasonably doubt the applicability of Pearson curves to the graduation. Ed.]

distributions of s^2. Evidence in favour of this assumption was supplied by "Sophister's" sampling, and I will add to this in Part II. We shall see that these curves can be made of simple practical value provided m_1 and m_2, as given by (13), (14) and (7) and (8) or (7) *bis* and (8) *bis*, can be easily found. Tables of the m's for a wide range of populations and different sample sizes would save much labour. Diagram V gives some idea of the variations to be expected in m_1 and m_2. Not only symmetrical populations, but also a number of typical skew populations—$\beta_1 = 0{\cdot}4$ and $\beta_1 = 1{\cdot}2$—have been selected. Co-ordinates (m_1, m_2) to the right of the line $m_1 - m_2 - 2 = 0$ indicate VI (F) curves; co-ordinates to the left give I (F). The lines are not straight but nearly so, and the diagram suggests relatively easy interpolation between values of the m's supposed tabulated for different sizes of samples from any given population. Finally, the diagram suggests the possibility of determining approximately the series of sampled populations for which the fixed start curves change over from Type I to Type VI. This series is roughly that given by the line $D(s^2)$ III in Diagram VI, which will be considered in the next section.

Let us, however, first consider different methods of calculating the chance P_{s^2} of obtaining in a random sample a more divergent s^2 than that observed:

1. *Tables of the Incomplete Beta Function.**

(a) The VI (F) curve.

The transformation $\xi = s^2/s^2 + a$ changes the curve of the equation (5) into

$$y = \text{constant} \times \xi^{m_2}(1-\xi)^{m_1 - m_2 - 2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (15).$$

Assuming the Incomplete Beta Function $y = \text{constant} \times x^{p-1}(1-x)^{q-1}$ tabled for different values of p, q and x, these tables would be entered with

$$\begin{cases} p = m_2 + 1, & q = m_1 - m_2 - 1, \\ x = \dfrac{s^2}{s^2 + a} = \dfrac{\dfrac{s^2}{\sigma^2}}{\dfrac{s^2}{\sigma^2} + \left(\dfrac{m_1 - m_2 - 2}{m_2 + 1}\right)\left(\dfrac{n-1}{n}\right)} = \dfrac{\dfrac{s^2}{\sigma^2}}{\dfrac{s^2}{\sigma^2} + \left(\dfrac{q-1}{p}\right)\left(\dfrac{n-1}{n}\right)}. \end{cases}$$

(b) The I (F) curve.

In this case Eqn. (6) can be written

$$y = \text{constant} \times \psi^{m_2}(1-\psi)^{-m_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots (16),$$

where $\psi = s^2/b$.

Enter the same tables with

$$\begin{cases} p = m_2 + 1, & q = 1 - m_1, \\ x = \dfrac{s^2}{b} = -\dfrac{(m_2+1)\,n}{(m_1 - m_2 - 2)(n-1)} \cdot \dfrac{s^2}{\sigma^2} = \dfrac{pn}{(p+q)(n-1)} \cdot \dfrac{s^2}{\sigma^2}. \end{cases}$$

The tables will give us the chance of exceeding any observed value of s^2 in random samples of n from a given population whose variance is σ^2. The same tables will help us to solve the inverse problem of finding the value of s^2, the

[* Manuscript Tables awaiting publication in the Biometric Laboratory. ED.]

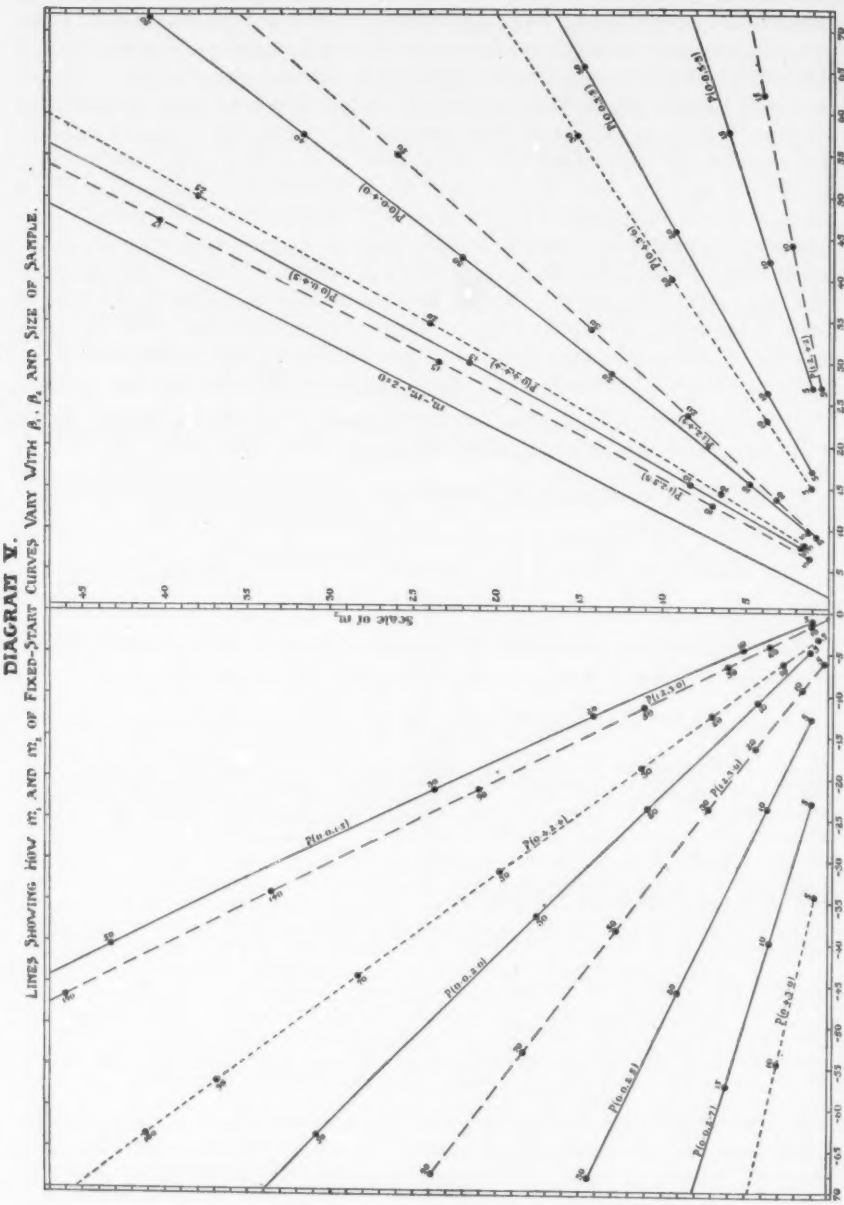


DIAGRAM V.

LINES SHOWING HOW m_1 AND m_2 OF FIXED-SPAN CURVES VARY WITH β_1, β_2 AND SIZE OF SAMPLE.

chance of exceeding which is a stated percentage. It may be noted that the use of these tables would be limited when m_1 and m_2 reach such high values that the corresponding indices of the tables are exceeded.

2. *Fisher's Z-Transformation.*

In his *Statistical Methods for Research Workers*, R. A. Fisher has given tables of a frequency function which may be turned into appropriate form for dealing with both Type I and Type VI distributions.

The function which he has used is

$$f(Z)dZ = \text{constant} \frac{e^{n_1 Z}\, dZ}{(n_2 + n_1 e^{2Z})^{\frac{(n_1+n_2)}{2}}} \quad \ldots\ldots\ldots\ldots\ldots\ldots(17),$$

and his Table VI gives, for various integral values of n_1 and n_2, the values of Z, the chances of exceeding which are 5 % and 1 % of random samples.

It is easy to show that the transformation $u = \frac{n_1}{n_2} e^{2Z}$ will put (17) into Type VI form,

$$F(u)\, du = \text{constant} \times u^{\frac{n_1}{2}-1} (u+1)^{-\frac{(n_1+n_2)}{2}} du \quad \ldots\ldots\ldots\ldots(18),$$

and the transformation $v = \frac{n_1}{n_1 + n_2 e^{-2Z}}$ will put (17) into Type I form,

$$F_1(v)\, dv = \text{constant} \times v^{\frac{n_1}{2}-1} (1-v)^{\frac{n_2}{2}-1} dv \quad \ldots\ldots\ldots\ldots(19).$$

Comparing (18) and (19) with (5) and (6) respectively, and using (9) and (11), we see that we may find from Fisher's tables the values of s^2/σ^2, the chances of exceeding which are ·05 and ·01 as follows:

(i) In the case of VI (F) we should enter the tables with $n_1 = 2(m_2 + 1)$ and $n_2 = 2(m_1 - m_2 - 1)$ to give Z, and from this we calculate

$$\frac{s^2}{\sigma^2} = \left(1 - \frac{2}{n_2}\right)\left(1 - \frac{1}{n}\right) e^{2Z},$$

n being the size of the sample and σ^2 the population variance.

(ii) Similarly in the case of I (F) we should use $n_1 = 2(m_2 + 1)$, $n_2 = 2(1 - m_1)$ and

$$\frac{s^2}{\sigma^2} = \left(\frac{n_1 + n_2}{n_1 + n_2 e^{-2Z}}\right)\left(\frac{n-1}{n}\right).$$

The values of s^2/σ^2 so found may then be compared with those observed. Judging from Diagram V we may note that $n_1 = 2m_2 + 1$ and $n_2 = 2(m_1 - m_2 - 1)$ or $2(1 - m_1)$ will frequently exceed 24 and 30 respectively. For cases which fall into this region Fisher gives approximate formulae* for calculating the ·05 and ·01 values of Z. In all cases the Z points corresponding to negative deviations are found by interchanging the values of n_1 and n_2.

* *Statistical Methods for Research Workers*, 2nd edition, p. 201.

3. *Woo's Tables**.

These tables deal with the function

$$f(\eta^2)\,d\eta^2 = \text{constant}\,(\eta^2)^{\frac{n-3}{2}}\,(1-\eta^2)^{\frac{N-n-2}{2}}\,d\eta^2 \quad \text{.....(20),}$$

and give for $n=3$ to 20 and $N=51$ to 1000, values of (i) mean $\overline{\eta^2}$, (ii) σ_{η^2}, and (iii) $\lambda = (\text{Observed } \eta^2 - \text{Mean } \overline{\eta^2})/\sigma_{\eta^2}$ corresponding approximately to tail areas of ·02 and ·01†.

Equation (20) can clearly be brought into comparison with (15) or (16), and the tables used, if it be remembered that for (15)

$$\text{Mean } \xi = \frac{m_2+1}{m_1}, \quad \sigma_\xi = \frac{1}{m_1}\sqrt{\frac{(m_2+1)(m_1-m_2-1)}{m_1+1}},$$

and for (16)

$$\text{Mean } \psi = \frac{m_2+1}{m_2-m_1+2}, \quad \sigma_\psi = \frac{1}{m_2-m_1+2}\sqrt{\frac{(m_2+1)(1-m_1)}{m_2-m_1+3}}.$$

The application of this method will also be limited owing to the fact that $2m_2+3=n$ of Woo's tables must be $\leqslant 20$.

Before concluding this discussion of Type I and Type VI distributions it must be pointed out that on using the three-moment method it has been found in certain exceptional cases that m_1, m_2 and a all assume negative values. For example, we may take the case of the Type IV population $P(1{\cdot}2,\ 5{\cdot}8)$ for which the following results were obtained:

n	m_1	m_2
5	6·6036	1·1928
10	12·9766	6·9931
20	139·3277	132·0899
25	−129·1512	−121·2776
30	− 52·1795	− 60·6907
50	− 31·3698	− 42·4382

All these $D(s^2)$ curves are of Type VI. The higher betas of the population were calculated from the difference formulae, and although the signs of the constants change, there is continuity in form as n is increased. If we take the case of $n=50$, the resulting curve $y = y_0(s^2)^{-42\cdot4382}(s^2+a)^{31\cdot3698}$ no longer starts at $s^2=0$ as intended, but at $s^2 = -a = +0{\cdot}2145\sigma^2$, where σ^2 is the population variance. In Part II experimental results will be discussed for the population $P(1{\cdot}219,\ 5{\cdot}809)$ which closely resembles the one treated above, and it would appear from these that the three-moment method may still provide a satisfactory fit.

* *Biometrika*, Vol. XXI. pp. 10—66.

† The quantities n and N of Woo's tables must not be confused with n and N as defined in section (2).

5. *Type III Distributions.*

Although these distributions are only limiting cases of Types I and VI they are of special importance because if a distribution of variance can be represented by a Type III curve, its probability integral may be obtained very rapidly from the Tables of the Incomplete Gamma Function. When speaking of a Type III curve as suitable, I mean only that B_1 and B_2 satisfy approximately the relation $2B_1 - 3B_1 - 6 = 0$, not that the true sampling curve is Type III. The experimental evidence contained in Part II, however, provides good reasons for believing that in such cases III (F) curves will give a satisfactory representation of $D(s^2)$.

Diagrams I to III show that the normal population is not the only population for which $D(s^2)$ is Type III. From Diagram II it is clear that if $\beta_1 = 0{\cdot}6$ and β_2 lies somewhere between 3·4 and 3·6, then $D(s^2)$ approximates to Type III form. Similarly from Diagram III, if $\beta_1 = 1{\cdot}2$ and β_2 is 4·2, $D(s^2)$ is very nearly Type III.

Although we cannot determine exactly the betas of the series of parent populations which give Type III distributions of variance, we can nevertheless reach approximations to their values which will be close enough for most practical purposes. I investigated the point rather fully for samples of 10. Tables I and II give, for $n = 10$, values of B_1 and B_2 for a wide range of parent populations. From these I prepared a third table, giving the values of $2B_2 - 3B_1 - 6$. By plotting these on a large scale I could find for every β_1 column of the tables a value of β_2 which makes the expression $2B_2 - 3B_1 - 6$ equal to zero. In this way I obtained the β's of 16 sampled populations, whose variance distributions in repeated samples of 10 can be represented to a very satisfactory degree of approximation by Type III curves.

These results, given in the table below, have been plotted, and are shown as the line $D(s^2)$ III in Diagram VI.

DIAGRAM VI

POPULATIONS FOR WHICH THE DISTRIBUTION OF VARIANCE IS APPROXIMATELY TYPE III

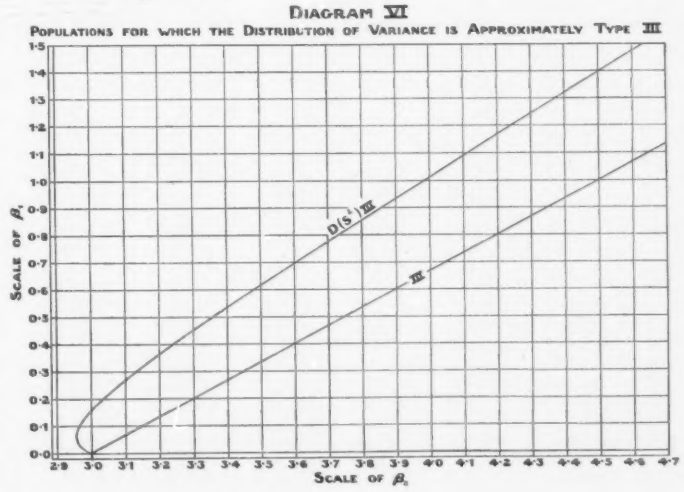


TABLE I. *Values of* B_1 (*for all of which* M_3 *is positive*) *for Samples of* 10.

β_2	β_1 0	·1	·2	·3	·4	·5	·6	·7	β_1
1·7	·02078	—	—	—	—	—	—	—	1·7
1·8	·05039	·01095	—	—	—	—	—	—	1·8
1·9	·08754	·03973	·00613	—	—	—	—	—	1·9
2·0	·13044	·08043	·03305	·00374	—	—	—	—	2·0
2·1	·17834	·12002	·07541	·02887	·00257	—	—	—	2·1
2·2	·23108	·18701	·12942	·07196	·02632	·00202	—	—	2·2
2·3	·28884	·25083	·19309	·12889	·06971	·02490	·00184	—	2·3
2·4	·35201	·32143	·26550	·19741	·12859	·06841	·02429	·00189	2·4
2·5	·42119	·39915	·34643	·27744	·20057	·12857	·07000	·02431	2·5
2·6	·49711	·48459	·43612	·36541	·28442	·20300	·12888	·06801	2·6
2·7	·58067	·57861	·53517	·46469	·37970	·29044	·20500	·12953	2·7
2·8	·67294	·68225	·64448	·57481	·48651	·39041	·29501	·20677	2·8
2·9	·77518	·79682	·76520	·69667	·60541	·50300	·38710	·29856	2·9
3·0	·88889	·92386	·89881	·83150	·73733	·62873	·51533	·40444	3·0
3·1	1·01582	1·06520	1·04703	·98087	·88354	·76853	·64623	·52446	3·1
3·2	1·15808	1·22303	1·21195	1·14664	1·04563	·92368	·79205	·65917	3·2
3·3	1·31817	1·39991	1·39605	1·33106	1·22557	1·09580	·95407	·80944	3·3
3·4	1·49910	1·59896	1·60226	1·53681	1·42570	1·28691	1·13388	·97656	3·4
3·5	1·70451	1·82384	1·83408	1·76706	1·64882	1·49938	1·33357	1·16213	3·5
3·6	1·93885	2·07902	2·09570	2·02558	1·89824	1·73607	1·55546	1·36815	3·6
3·7	2·20757	2·36993	2·39212	2·31685	2·17788	2·00035	1·80244	1·59539	3·7
3·8	2·51743	2·70317	2·72942	2·64624	2·49238	2·29620	2·07789	1·85148	3·8
3·9	2·87689	3·08687	3·11495	3·02020	2·84729	2·62833	2·38576	2·13496	3·9
4·0	3·29661	3·53114	3·55772	3·44650	3·24923	3·00232	2·73075	2·45134	4·0
4·1	3·79024	4·04865	4·06883	3·93461	3·70614	3·42481	3·11839	2·80522	4·1
4·2	4·37539	4·65541	4·66201	4·49610	4·22765	3·90375	3·55323	3·20202	4·2
4·3	5·07514	5·37191	5·35472	5·14525	4·82541	4·44865	4·04907	3·64812	4·3
4·4	5·92017	6·22466	6·16866	5·89974	5·51371	5·07103	4·58953	4·15108	4·4
4·5	6·95195	7·24839	7·13184	6·78181	6·31012	5·78485	5·24679	4·71988	4·5
4·6	8·22758	8·48931	8·28044	7·81951	7·23646	6·60718	5·97529	5·36521	4·6
4·7	9·82740	10·00987	9·66183	9·04870	8·32004	7·55902	6·81103	6·09991	4·7
4·8	11·86719	11·89601	11·33895	10·51571	9·59537	8·66641	7·77394	6·93943	4·8
4·9	14·51862	14·26846	13·39672	12·28112	11·10644	9·96191	8·88852	7·90252	4·9
5·0	18·04474	17·30088	15·95179	14·42528	12·91002	11·48658	10·18511	9·01201	5·0

β_2	β_1 ·8	·9	1·0	1·1	1·2	1·3	1·4	1·5	β_1
2·5	·00214	—	—	—	—	—	—	—	2·5
2·6	·02482	·00255	—	—	—	—	—	—	2·6
2·7	·06866	·02573	·00315	—	—	—	—	—	2·7
2·8	·13052	·06977	·02700	·00392	—	—	—	—	2·8
2·9	·20847	·13188	·07128	·02858	·00489	—	—	—	2·9
3·0	·30142	·21018	·13347	·07315	·03044	·00606	—	—	3·0
3·1	·40895	·30383	·21199	·13541	·07534	·03256	·00744	—	3·1
3·2	·53115	·41240	·30597	·21394	·13763	·07783	·03492	·00902	3·2
3·3	·66853	·53600	·41509	·30797	·21604	·14011	·08057	·03750	3·3
3·4	·82198	·67513	·53947	·41725	·30993	·21837	·14285	·08356	3·4
3·5	·99273	·83069	·67962	·54193	·41908	·31192	·22082	·14583	3·5
3·6	1·18239	1·00387	·83642	·68252	·54367	·42072	·31399	·22351	3·6
3·7	1·39290	1·19601	1·01105	·83986	·68422	·54492	·42226	·31618	3·7
3·8	1·62661	1·40972	1·20502	1·01513	·84156	·68506	·54585	·42379	3·8
3·9	1·88629	1·64658	1·42020	1·20979	1·01682	·84194	·68529	·54659	3·9
4·0	2·17520	1·90953	1·65880	1·42564	1·21142	1·01668	·84137	·68510	4·0
4·1	2·49718	2·20173	1·92344	1·66483	1·42711	1·21064	1·01516	·84011	4·1
4·2	2·85667	2·52690	2·21718	1·92988	1·66596	1·42550	1·20801	1·01264	4·2
4·3	3·25895	2·88935	2·54360	2·22375	1·93090	1·66327	1·42152	1·20400	4·3
4·4	3·71019	3·29415	2·90686	2·54986	2·22325	1·92626	1·65761	1·41574	4·4
4·5	4·21764	3·74722	3·31180	2·91220	2·54781	2·21720	1·91851	1·64969	4·5
4·6	4·78990	4·25549	3·76407	3·31540	2·90802	2·53922	2·20682	1·90799	4·6
4·7	5·43714	4·82712	4·27028	3·76483	3·30785	2·89594	2·52553	2·19312	4·7
4·8	6·17150	5·47176	4·83814	4·26673	3·75284	3·29155	2·87808	2·50793	4·8
4·9	7·00753	6·20083	5·47675	4·82842	4·24874	3·73087	3·26846	2·85570	4·9
5·0	7·96270	7·02792	6·19680	5·45841	4·80243	4·21949	3·70121	3·24018	5·0

TABLE II. *Values of* B_2 *for Samples of* 10.

β_1

β_2	0	·1	·2	·3	·4	·5	·6	·7	β_2
1·7	2·86456	—	—	—	—	—	—	—	1·7
1·8	2·89504	2·84141	—	—	—	—	—	—	1·8
1·9	2·94348	2·86090	2·81034	—	—	—	—	—	1·9
2·0	3·00514	2·90676	2 82600	2·77577	—	—	—	—	2·0
2·1	3·07773	2·97295	2·87229	2·79164	2·74043	—	—	—	2·1
2·2	3·16039	3·05653	2·94105	2·83994	2·75854	2·70565	—	—	2·2
2·3	3·25321	3·16145	3·03516	2·91510	2·80958	2·72706	2·67220	—	2·3
2·4	3·35698	3·27074	3·14721	3·01418	2·88873	2·78116	2·69738	2·64046	2·4
2·5	3·47308	3·40276	3·27931	3·13673	2·99342	2·86385	2·75683	2·66953	2·5
2·6	3·60350	3·55353	3·43343	3·28097	3·12281	2·97303	2·83983	2·72971	2·6
2·7	3·75083	3·72580	3·60959	3·45037	3·27734	3·10811	2·95310	2·81821	2·7
2·8	3·91846	3·92331	3·81333	3·64680	3·45864	3·26975	3·09244	2·93373	2·8
2·9	4·11076	4·15097	4·04836	3·87391	3·66946	3·45975	3·25171	3·07621	2·9
3·0	4·33333	4·41515	4·32059	4·13666	3·91368	3·68096	3·45543	3·24667	3·0
3·1	4·59355	4·72417	4·63764	4·44150	4·19652	3·93742	3·68393	3·44708	3·1
3·2	4·90115	5·08893	5·00943	4·79680	4·52475	4·23445	3·94883	3·68044	3·2
3·3	5·26929	5·52392	5·44892	5·21333	4·90706	4·57893	4·25546	3·95082	3·3
3·4	5·71607	6·04869	5·97319	5·70509	5·34268	4·97965	4·61070	4·26352	3·4
3·5	6·26713	6·69009	6·60511	6·29039	5·88177	5·44779	5·02332	4·62526	3·5
3·6	6·95979	7·48592	7·38834	6·99349	6·50718	5·99767	5·50405	5·04455	3·6
3·7	7·85050	8·49077	8·32835	7·84697	7·25527	6·64768	6·06714	5·53105	3·7
3·8	9·02866	9·78598	9·52407	8·89543	8·15852	7·42174	6·73033	6·10125	3·8
3·9	10·64414	11·49758	11·05232	10·20108	9·26074	8·35126	7·51655	6·76918	3·9
4·0	12·96816	13·83027	13·04780	11·85282	10·62210	9·47809	8·45567	7·55761	4·0
4·1	16·54536	17·13708	15·72173	13·98132	12·32695	10·85884	9·58698	8·49457	4·1
4·2	22·65042	22·07656	19·42171	16·78508	14·49651	12·57159	10·96293	9·61658	4·2
4·3	35·11475	30·01778	24·75629	20·57805	17·30990	14·72623	12·65476	10·97180	4·3
4·4	73·11500	44·30083	33·88099	25·88218	21·04109	17·48137	14·74341	12·62469	4·4
4·5	—	75·56330	46·25159	33·62219	26·12663	21·07267	17·42063	14·66298	4·5
4·6	—	183·73965	71·04536	45·58009	33·29871	25·86259	20·83555	17·20836	4·6
4·7	—	—	127·95996	65·61843	43·86955	32·43272	25·30676	20·42803	4·7
4·8	—	—	349·79011	103·74161	60·39827	41·76654	31·29989	24·58910	4·8
4·9	—	—	—	195·28902	88·54917	55·64353	39·56693	30·05191	4·9
5·0	—	—	—	605·14926	143·43030	77·58854	51·38966	37·40706	5·0

β_1

β_2	·8	·9	1·0	1·1	1·2	1·3	1·4	1·5	β_2
2·5	2·61061	—	—	—	—	—	—	—	2·5
2·6	2·64352	2·58270	—	—	—	—	—	—	2·6
2·7	2·70651	2·61929	2·55671	—	—	—	—	—	2·7
2·8	2·79732	2·68487	2·59677	2·53258	—	—	—	—	2·8
2·9	2·91501	2·77769	2·66471	2·57585	2·51023	—	—	—	2·9
3·0	3·05974	2·89700	2·75917	2·64594	2·55646	2·48955	—	—	3·0
3·1	3·23263	3·04326	2·87975	2·74181	2·62849	2·53852	2·47045	—	3·1
3·2	3·43574	3·21765	3·02697	2·86328	2·72553	2·61227	2·52192	2·45283	3·2
3·3	3·67208	3·42227	3·20211	3·01100	2·84762	2·71029	2·59723	2·50656	3·3
3·4	3·94565	3·66011	3·40731	3·18633	2·99547	2·83275	2·69605	2·58328	3·4
3·5	4·26166	3·93510	3·64550	3·39138	3·17052	2·98046	2·81869	2·68275	3·5
3·6	4·62666	4·25230	3·92054	3·62904	3·37486	3·15487	2·96602	2·80541	3·6
3·7	5·04886	4·61790	4·23730	3·90305	3·61131	3·35806	3·13952	2·95219	3·7
3·8	5·53853	5·04023	4·60189	4·21814	3·88349	3·59277	3·34122	3·12455	3·8
3·9	6·10853	5·52867	5·02186	4·58013	4·19595	3·86252	3·57381	3·32452	3·9
4·0	6·77503	6·09556	5·50653	4·99622	4·55426	4·17164	3·84065	3·55469	4·0
4·1	7·55851	6·75616	6·06744	5·47526	4·96526	4·52547	4·14592	3·81830	4·1
4·2	8·48511	7·52961	6·71891	6·02812	5·43732	4·93049	4·49468	4·11933	4·2
4·3	9·58853	8·44020	7·47882	6·66821	5·98065	5·39460	4·89310	4·46263	4·3
4·4	10·91275	9·51891	8·36961	7·41217	6·60782	5·92742	5·34861	4·85401	4·4
4·5	12·51586	10·80576	9·41973	8·28074	7·33428	6·54066	5·87026	5·30051	4·5
4·6	14·47582	12·35303	10·66566	9·29999	8·17929	7·24870	6·46898	5·81060	4·6
4·7	16·89898	14·22996	12·15411	10·50299	9·16643	8·06921	7·15813	6·39451	4·7
4·8	19·93328	16·52959	13·94692	11·93205	10·32607	9·02410	7·95940	7·06464	4·8
4·9	23·78919	19·37920	16·12559	13·64193	11·69624	10·14073	8·87679	7·83608	4·9
5·0	28·77402	22·95631	18·80005	15·70441	13·32578	11·45349	9·95131	8·72730	5·0

Any parent population whose β's lie on this line, has for samples of 10 a $D(s^2)$ which can be adequately described by a Type III curve. Such a parent population we call for brevity a "$D(s^2)$ III Population."

$D(s^2)$ Type III Populations.

β_1	0·0	0·1	0·2	0·3	0·4	0·5	0·6	0·7
β_2	3·000	2·964	3·033	3·131	3·242	3·358	3·482	3·605

β_1	0·8	0·9	1·0	1·1	1·2	1·3	1·4	1·5
β_2	3·732	3·859	3·986	4·114	4·245	4·373	4·505	4·636

The question at once arises as to how far these $D(s^2)$ III populations lead to Type III variance distributions for other sizes of samples. Turning to Diagrams I, II and III we find, as stated before, that the converging lines are generally curved towards the Type III line, but become more and more nearly straight the nearer they approach the latter. In addition to this the Type III line is, it seems, not cut by a converging line. We are therefore almost prepared to conclude *that the above series of $D(s^2)$ III populations lead approximately to Type III variance distributions for any size of sample.*

I have tested this point numerically by selecting three of the $D(s^2)$ III populations, and calculating $2B_2 - 3B_1 - 6$ in each case for different values of the sample size. This is, of course, done by applying the difference formulae to β_1 and β_2, to obtain β_3, β_4 and β_6, and using these in equations (2)—(4). The results are given in the table below:

n	P (0·3, 3·131)			P (0·6, 3·482)			P (1·2, 4·245)		
	B_1	B_2	$2B_2-3B_1-6$	B_1	B_2	$2B_2-3B_1-6$	B_1	B_2	$2B_2-3B_1-6$
5	2·26745	6·41673	+·0311	2·81327	7·26169	+·0836	3·82849	8·81189	+·1383
10	1·03040	4·54574	+·0003	1·29564	4·94338	−·0002	1·78162	5·67225	−·0004
20	0·49245	3·73573	+·0059	0·62211	3·92696	−·0124	0·85856	4·27756	−·0206
50	0·19184	3·28576	−·0040	0·24289	3·36003	−·0086	0·33582	3·49706	−·0133

As expected, the values of $2B_2 - 3B_1 - 6$ are small for samples of 10. For n greater than 10 they remain small, and even for $n = 5$ the values 0·1383 and 0·0836 are not so large as to invalidate the use of Type III because B_1 and B_2 are themselves large in these cases.

We note also that for all three populations considered there is a change of sign in the numerical values of $2B_2 - 3B_1 - 6$, indicating that the Type III line is

actually cut by the converging lines—a fact which is also shown for the exceptional cases illustrated in Diagram IV. The curious variations shown in that diagram are, however, found only in the case of some *U*- and *J*-shaped populations of Type I.

The conclusion reached above seems important. It means that in addition to the normal population $P(0, 3)$, a series of non-normal parent populations, called $D(s^2)$ III populations in Diagram VI, has been found for which $D(s^2)$ can be adequately represented, *for any size* of sample, by Type III curves. We may fit either III (N.F) or III (F) curves in these cases.

In the latter case only the first and second moments of $D(s^2)$ would be needed, i.e.,

$$M_1' = \frac{n-1}{n} \cdot \sigma^2 \quad \text{and} \quad M_2 = \frac{(n-1)^2}{n^3} \sigma^4 \left(\beta_2 - 3 + \frac{2n}{n-1}\right),$$

and the curve will assume the form

$$f(s^2)\, ds^2 = \text{constant} \left(\frac{s^2}{\sigma^2}\right)^{\left(\frac{n}{\beta_2 - \frac{n-3}{n-1}} - 1\right)} \cdot e^{-\frac{n^2}{(n-1)\left(\beta_2 - \frac{n-3}{n-1}\right)} \cdot \left(\frac{s^2}{\sigma^2}\right)} \cdot ds^2 \ldots (21),$$

in which it will be seen that only n, σ^2 and β_2 are involved, β_1 being entirely absent.

For a normal population $\beta_2 = 3$ and (21) simplifies to

$$f(s^2)\, ds^2 = \text{constant} \left(\frac{s^2}{\sigma^2}\right)^{\frac{n-3}{2}} e^{-\frac{ns^2}{2\sigma^2}} ds^2 \quad \ldots\ldots\ldots\ldots (21)\, bis,$$

which is the well-known curve due to "Student*."

If Tables of the Incomplete Gamma Function be used in connection with (21), they would be entered, using the customary notation, with

$$p = \frac{n}{\beta_2 - \frac{n-3}{n-1}} - 1, \text{ and } u = \frac{n^{\frac{3}{2}}}{(n-1)\sqrt{\beta_2 - \frac{n-3}{n-1}}} \cdot \frac{s^2}{\sigma^2}.$$

The equation (21) may of course be expected to give a reasonable approximation to the form of $D(s^2)$ for other populations whose β_1 and β_2 lie in the neighbourhood of the $D(s^2)$ III line. Further light will be thrown on its range of applicability by the discussion of the experimental results in Part II.

6. *Distributions Approximately Normal.*

An examination of the tables giving the betas of $D(s^2)$ showed that even for samples as small as 20, drawn from certain Type I populations, B_1 and B_2 differ by small amounts only from 0 and 3. It was also noticed, as expected, that this small region, which at $n = 20$ is confined to certain *U*- and *J*-shaped populations, expands as the sample is increased, to cover more and more of the (β_1, β_2) field. We can hardly of course assert without further examination, that because B_1 and B_2 are very

* [To Helmert: see footnote †, p. 137. ED.]

nearly 0 and 3 the sampling distribution of s^2 can be closely represented by a normal curve, when the parent population distributions are of U or J form*; but in the region of less extreme population forms it is fairly certain that the approach of B_1 and B_2 to 0 and 3 corresponds to the approach of $D(s^2)$ to normality.

It seemed to me therefore of some practical value to give an indication of the limits as to population and sample size within which $D(s^2)$ may be considered as normal. I have supposed that for most practical uses it will be justifiable to assume normality if $B_1 \leqslant \cdot 02$ and $2 \cdot 9 \leqslant B_2 \leqslant 3 \cdot 1$, and my work proceeded as follows: (i) From tables of B_1 I sorted out graphically, for different sample sizes, all those populations for which $D(s^2)$ has $B_1 \leqslant \cdot 02$; (ii) secondly, I repeated the process—using tables of B_2—finding all populations for which $D(s^2)$ has $2 \cdot 9 \leqslant B_2 \leqslant 3 \cdot 1$; and (iii) lastly, from the results of (i) and (ii) I determined all populations which satisfy the conditions of (i) and (ii) simultaneously. These final results are shown in Diagram VII. For all populations whose (β_1, β_2) co-ordinates lie in the shaded portion of the diagram, $D(s^2)$ for samples of 20 has B_1 and B_2 within the limits specified above. The shaded area expands as the sample size increases, and the numbered lines show the resulting boundaries. This widening of the shaded field occurs in three directions; towards the line $\beta_2 - \beta_1 - 1 = 0$; away from the β_2-axis; and towards the heterotypic area. The expansion in the first direction would appear to be of little practical interest, and was not followed up; the limiting line on the left of the diagram is actually that along which $B_1 = 0$ (i.e. on which the variance distribution is symmetrical) for samples of 10. The expansion in the second direction soon passes beyond the range of the diagram; it is the third series of expanding lines in which we are interested. The diagram is limited on the right-hand side by

$n=100$			$n=400$		
Population	B_1	B_2	Population	B_1	B_2
P (0, 2·23)	·0200	3·0145	P (0, 3·0)	·0201	3·0301
P (·7, 2·89)	·0193	2·9926	P (·7, 3·36)	·0198	3·0232
P (1·4, 3·59)	·0193	2·9761	P (1·4, 4·06)	·0198	3·0187

$n=1000$			$n=2000$		
Population	B_1	B_2	Population	B_1	B_2
P (0, 3·64)	·0199	3·0432	P (0, 4·12)	·0199	3·0783
P (·7, 3·87)	·0197	3·0345	P (·7, 4·37)	·0202	3·0470
P (1·4, 4·56)	·0196	3·0299	P (1·4, 5·07)	·0200	3·0390

* In a paper "On the Means of Samples from a U-Shaped Population," *Biometrika*, Vol. xx^A. p. 361, Church and Holzinger have drawn attention to peculiar variations in the case of the sampling distribution of Means.

DIAGRAM XII

SHOWING HOW THE SHADED (β_1, β_2) FIELD OF POPULATIONS, GIVING APPROXIMATELY NORMAL $D(s^2)$, EXPANDS AS THE SIZE OF THE SAMPLE INCREASES

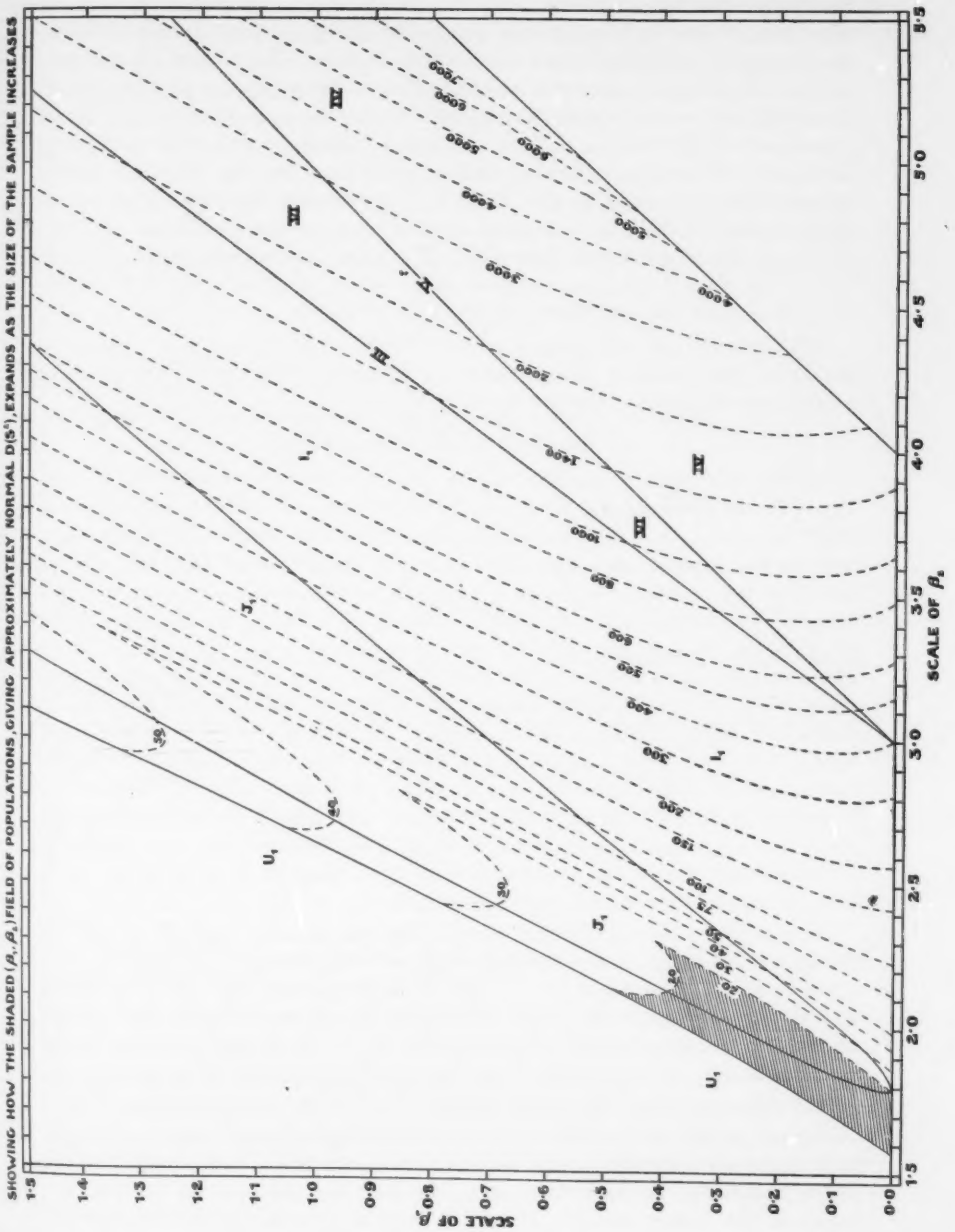


DIAGRAM XIII
SHOWING HOW THE SHADED (β_1, β_2) FIELD OF POPULATIONS, GIVING APPROXIMATELY NORMAL D(S^2), EXPANDS AS THE SIZE OF THE SAMPLE INCREASES
SCALE OF β_1
SCALE OF β_2
I
II
III
IV
V
VI
VII
U_1
J_1
I_1
J'_1
U'_1
50
40
30
20
10
7
5
4
3
2
1.5
1000
800
600
500
400
300
250
200
150
100
75
50
40
30
20
10
7
5
4
3
2
1.5
0·0
0·1
0·2
0·3
0·4
0·5
0·6
0·7
0·8
0·9
1·0
1·1
1·2
1·3
1·4
1·5
2·0
2·5
3·0
3·5
4·0
4·5
5·0
5·5

the straight line $8\beta_2 = 15\beta_1 + 32$, which is parallel to the boundary of the heterotypic area, because as this region is approached the use of the difference formulae to calculate B_1 and B_2 becomes of doubtful value, as will be discussed in the next section. The diagram shows the bounding lines of the expanding population field for certain values of n between 20 and 7000. For $n = 10$, no populations were found with B_1 and B_2 both within the selected limits. Between $n = 75$ and $n = 3000$ the numbered lines are simply those determined by the condition $B_1 \leqslant \cdot 02$; the bounding lines satisfying the condition $2 \cdot 9 \leqslant B_2 \leqslant 3 \cdot 1$ lying further to the right. Indeed it is probable that when the first condition is satisfied (for n between 75 and 3000) we shall have $2 \cdot 95 \leqslant B_2 \leqslant 3 \cdot 05$ in these cases. This point is illustrated in the following table which gives the values of B_1 and B_2 for a few populations situated close to the lines marked 100, 400, 1000 and 2000 in the diagram.

For a sample size associated with any boundary and a population situated to the left of that boundary, the deviations of B_1 and B_2 from the normality will of course generally be less than the above.

7. *Type IV Distributions.*

If the $D(s^2)$ curves are obtained by the fixed start three-moment method, Type IV will not occur, but we may reach such curves if the four-moment method of fitting be used. A curve whose lower tail stretches to ∞ is not likely to represent well the true distribution in the case of very small samples, where there is an abrupt rise from the start at $s^2 = 0$, but it may well be adequate in the case of larger samples. The Diagrams I—III show that the $D(s^2)$ with the (B_1, B_2) points lying in the Type IV area are generally associated with very leptokurtic populations whose (β_1, β_2) points also lie in that area. It must, however, be remembered that these values of B_1 and B_2 have been found by using the difference formulae to obtain the higher moments of the sampled population. While it is true that Type IV curves provide good graduation to many distributions of practical experience, as the so-called heterotypic area is approached, the higher moments obtained by inserting values of β_1 and β_2, however accurate, into these difference formulae are likely to agree less and less closely with the true higher moments of such distributions. The higher moments of the theoretical Type IV curve become infinite, while those of any real distribution must remain finite.

It is therefore necessary to consider how far the values of B_1 and B_2 found in the theoretical manner we have so far employed will be those of the true $D(s^2)$ of a real leptokurtic population. This point will be discussed in Part II in connection with the experimental data. The same criticism may of course be levelled against the use of the difference formulae in obtaining B_1 for the fixed start curves, but as B_1 depends only on the population β_4, while B_2 depends also on β_5 and β_6, the uncertainty as to the precise values of higher moments will be of less import.

Where, on the other hand, our knowledge of the population is represented by a very large sample, it will be possible to calculate the higher moments from this, and so obtain B_1 and B_2 without using the difference formulae at all. But the values of the higher moments of even a large sample may differ considerably

through sampling fluctuation from the true values, and consequently even in this case it may be better to make use of a certain smoothing effect that the difference formulae will have on the values of the higher moment coefficients. Experimental results appear to suggest firstly, that we need run the risk of these probable errors in the higher moments of a sample only if the sample represents a very leptokurtic population whose (β_1, β_2) point lies *in* the heterotypic area, or is situated so near to it that the use of the difference formulae is likely to be inadequate. Secondly, if we decide on using sample values as distinguished from difference formulae moments, the fixed start method appears to be more satisfactory than the four-moment fit, because it disposes of the uncertainty as to the true values of β_5 and β_6.

PART II.

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1. *Introductory.*

In this part we shall

(1) Test on experimental data the adequacy of our fixed start three-moment curves described in Part I.

(2) Determine how far Type III curves with fixed start may be useful as approximations to distributions of variance.

(3) Test how far we may be misled if, when knowing only β_1 and β_2 of the sampled population, we calculate its higher moments, and therefore B_1 and B_2 of $D(s^2)$ by using the difference formulae.

(4) Determine how far skewness may be a source of error when inferences are drawn on the hypothesis that the parent population is normal. Variance curves based on this assumption will be referred to as "Normal Theory" curves.

(5) Finally we shall make use of our results to compare in a general way tail proportions corresponding to certain deviations from the mean, for various curves, all having a common mean and standard deviation, but not necessarily the same third and fourth moments.

It will not be part of our purpose to compare the observed *moments* of $D(s^2)$ with the theoretical values. There is no reason why these moments should differ from those given by equations (1) to (4) by quantities greater than the order of their probable errors. Our main object is to find suitable *curves* for representing $D(s^2)$ when its moments are already known in terms of the sampled population, and we shall base our test solely on such curves.

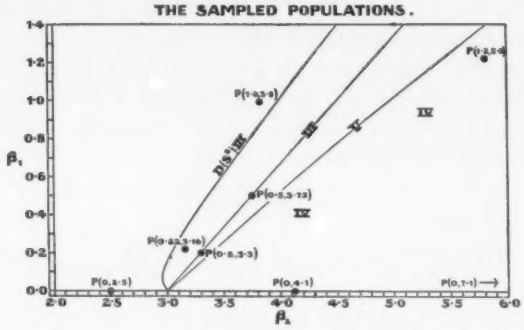
I have followed Church in applying the difference formulae to the uncorrected parent population moment coefficients in order to obtain the values of β_3, β_4 and β_6; but, as explained in Part I, it was considered necessary to test how far B_1 and B_2, obtained in this way, would be those of the true s^2 distribution of a real lepto-kurtic population. In order to discriminate between, say β_6, calculated from the difference formulae, and its actual value we shall write β_6 (diff. form.) and β_6 (actual) respectively. Similarly for β_3 and β_4. Hence we shall also write B_1 (diff. form.), B_1 (actual), B_2 (diff. form.) etc. Type curves fitted from these differing values of the betas of $D(s^2)$ will be referred to as I (F)—(diff. form.), VI (F)—(actual), I (N.F)—(actual); IV—(actual), etc.

2. *The Parent Populations.*

The (β_1, β_2) points of the experimental populations are shown in Diagram VIII.

DIAGRAM VIII

THE SAMPLED POPULATIONS.



With the exception of that for P (1·2, 5·8), the sampling results upon which the following discussion is based were placed at my disposal by Dr E. S. Pearson, who has kindly written the following note:

"The experimental method seems to open out one of the most hopeful routes by which to explore the sampling distributions of frequency constants in small samples from non-normal populations. No experimental programme, of course, could possibly cover all the populations likely to be met in common experience, but a great variety of types of frequency form may be well represented by taking samplings from a selection of symmetrical and skew Pearson curves. The ideal method of random sampling from an infinite population has not yet perhaps been found, but the use of Tippett's Table of Random Numbers leads undoubtedly to a very convenient and rapid form of procedure. The scheme most easily arranged with their help corresponds to what may be termed sampling with replacement from a population of 10,000, although with extra labour this total could be increased to 100,000 or more*.

* *Tracts for Computers*, No. xv. The figures are arranged in columns of four, giving 10,000 numbers between 0000 and 9999, but five figures could be used at once if desired giving a range of 00000 to 99999.

"This limitation in numbers means that it is impossible to arrange a tailing off of the population distribution which will follow exactly the group frequencies of the theoretical curve; the chance of an observation falling into a group can be made ·0000, ·0001, ·0002, etc., but not any intermediate value. The effect of this is only really noticeable in the case of leptokurtic distributions; for example, for the extremely leptokurtic symmetrical population $P(0, 7{\cdot}1)$ the Type VII curve gave a proportion ·0006 beyond the 33rd group from the centre, ·0002 beyond the 43rd group, and ·0001 beyond the 50th. The actual distribution chosen for the final 6 units out of 10,000 is shown in Table III. This allocation may appear arbitrary, but it should be remembered, for example, that in 1000 random samples of 10 from this distribution, we should only expect about 4 individuals to be drawn from the group lying beyond the limits Mean $\pm$ 43 grouping units = Mean $\pm$ $6{\cdot}7\sigma$. Consequently, while the exact arrangement of the tail form may modify the limiting distribution of frequency constants in an infinite number of samples, it can have no appreciable effect upon the observed distribution in such a series of 1000 samples. That is to say, it will be something of a finer order than the present experimental method can detect. The distributions of 10,000, tabled below, represent therefore, with this limitation, Pearson curves whose probability integrals were obtained in the following way.

"$P(0, 2{\cdot}5)$, Type II curve, $y = y_0(1 - x^2)^{\frac{m}{2}}$: $m = 7$ and frequencies obtained by using the transformation $t = x\sqrt{(m+2)/(1-x^2)}$ and entering 'Student's' tables* of the Type VII curve, with t and $n' = m + 3 = 10$.

"$P(0, 4{\cdot}1)$ and $P(0, 7{\cdot}1)$, Type VII curves, $y = y_0(1 + x^2)^{-\frac{m}{2}}$. For the first population $m = 10$, and for the second $m = 6$, and 'Student's' tables were entered with $t = x\sqrt{m-1}$ and $n' = m$.

"$P(0{\cdot}2, 3{\cdot}3)$ and $P(0{\cdot}5, 3{\cdot}7\bar{5})$; Type III curves, $y = y_0\, e^{-x} x^p$. The Tables of the Incomplete Gamma Function were used and entered with p and $u = x/\sqrt{p+1}$. For the first population $p = 19$ and for the second $p = 7$.

"$P(1{\cdot}0, 3{\cdot}8)$, Type I curve, $y = y_0\, x^{p-1}(1-x)^{q-1}$. In this case $p = 7{\cdot}0$, $q = 1{\cdot}5$, and unpublished Tables of the Incomplete Beta Function were used.

"$P(1{\cdot}2, 5{\cdot}8)$, Type IV curve, $y = y_0(1 + x^2)^{-m} e^{-\nu \tan^{-1} x}$. The group frequencies were found by quadrature, the constants being $m = 6{\cdot}1928$ and $\nu = -11{\cdot}6687$."

The necessary constants of the grouped frequencies of Table III are given below.

The population $P(0, 7{\cdot}1)$ falls inside the region where the difference formulae fail. For all other populations the latter have been applied quite straightforwardly to β_1 and β_2, to obtain the values of β_3, β_4 and β_6 tabled above. In the cases of $P(0, 4{\cdot}1)$ and $P(1{\cdot}2, 5{\cdot}8)$, however, $D(s^2)$ curves have also been fitted by using the actual higher betas—(Table IV (*b*))—because in these cases B_1 (actual) and B_2 (actual) differed considerably from B_1 (diff. form.) and B_2 (diff. form.) respectively. No such curves were computed for the more platykurtic populations $P(0, 2{\cdot}5)$,

* *Metron*, v. N. 3. pp. 114—117.

TABLE III.

Grouped Frequencies of the Parent Population.

The central group (in brackets) and frequencies toward one tail only given				Complete Distributions				
P (0, 2·5)		P (0, 4·1)	P (0, 7·1)	P (0·2, 3·3)		P (0·5, 3·7)	P (1·0, 3·8)	P (1·2, 5·8)
$n=5$, 10	$n=20$	$n=5$, 10, 20	$n=5$, 10, 20	$n=5$, 10	$n=20$	$n=5$, 10, 20	$n=5$, 10, 20	$n=5$, 25
(582)	(348)	(774)	(758) —	1	1 8	1	141 57	1 1
576	348	758	740 —	4	3 6	9	245 52	4 1
562	345	710	690 —	12	6 5	37	298 47	12 1
537	340	637	615 —	30	12 3	98	332 43	33 1
504	332	550	529 —	62	25 2	197	353 39	79 1
464	322	459	440 —	116	42 2	327	367 35	163 —
419	311	369	355 1	193	70 1	472	375 32	292 1
368	298	291	282 —	293	106 1	611	377 28	457 —
316	284	222	221 —	406	153 —	726	376 26	631 1
264	268	168	170 —	526	209 1	802	373 23	783 —
213	251	123	130 —	636	272 —	839	366 21	886 —
164	234	91	100 —	726	339 —	834	358 18	926 1
124	214	66	77 —	786	405 1	796	349 16	908
84	196	47	58 —	813	467	734	339 15	843
56	177	34	45 —	804	522	654	327 13	750
32	159	24	35 —	765	565	569	315 11	644
17	139	18	27 —	703	594	482	303 9	538
7	122	12	21 1	624	609	400	290 9	440
2	104	9	16	538	608	325	277 8	353
	88	7	13	451	596	260	264 6	280
	74	5	10	367	569	205	252 6	220
	60	3	8	294	534	159	239 5	171
	46	3	7	228	491	121	226 4	133
	37	1	5	174	445	92	213 3	102
	27	2	5	130	395	69	202 3	79
	19	1	3	96	346	51	190 3	61
	14	1	3	69	298	37	178 2	47
	8	—	2	49	254	27	168 2	36
	5	1	2	34	214	20	157 1	28
	3	—	2	24	176	14	146 1	21
	1	—	2	16	145	9	137 1	17
		—	1	10	117	7	128 1	13
		—	1	7	94	5	119 1	10
		—	—	5	75	4	110 —	8
		1	1	3	58	2	102 1	6
			1	2	46	2	94 —	5
			—	1	35	1	87 —	4
			1	1	27	—	80 —	3
			—	—	20	1	74 1	2
			—	—	15	—	68	2
			1	1	12	1	62	1
			Contd. above		Contd. above		Contd. above	Contd. above
10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000

TABLE IV (*a*).

Moment Coefficients of the Parent Populations.*

Population	$P(0, 2{\cdot}5)$		$P(0, 4{\cdot}1)$	$P(0, 7{\cdot}1)$
Size of Sample	5, 10	20	5, 10, 20	5, 10, 20
Variance	40·0880	111·1844	32·2006	41·6628
β_1	zero	zero	zero	zero
β_2	2·502,308	2·500,216	4·116,472	7·052,419
β_3 (diff. form.)	zero	zero	zero	zero
β_4 (diff. form.)	8·950,965	8·930,666	44·982,997	—
β_6 (diff. form.)	39·241,904	39·079,258	1689·837,300	—

Population	$P(0{\cdot}2, 3{\cdot}3)$		$P(0{\cdot}5, 3{\cdot}7)$	$P(1{\cdot}0, 3{\cdot}8)$	$P(1{\cdot}2, 5{\cdot}8)$
Size of Sample	5, 10	20	5, 10, 20	5, 10, 20	5, 25
Variance	25·077,540	44·526,447	25·076,158	153·028,332	25·246,326
β_1	0·197,985	0·199,418	0·492,087	0·990,852	1·219,224
β_2	3·293,248	3·298,813	3·724,935	3·834,159	5·808,791
β_3 (diff. form.)	2·091,590	2·113,107	5·608,458	9·391,166	25·188,100
β_4 (diff. form.)	21·646,971	21·772,754	32·418,438	31·734,932	142·955,600
β_6 (diff. form.)	239·417,353	242·286,129	504·365,310	385·229,752	12322·996,300

TABLE IV (*b*).

Actual Higher Moment Coefficients of Three of the Parent Population.

Population	$P(0, 4{\cdot}1)$	$P(0, 7{\cdot}1)$	$P(1{\cdot}2, 5{\cdot}8)$
Size of Sample	5, 10, 20	5, 10, 20	5, 25
β_3 (actual)	zero	zero	19·1459
β_4 (actual)	40·139,405	206·291,108	115·1417
β_6 (actual)	712·914,988	11648·105,020	4069·0114

$P(0{\cdot}2, 3{\cdot}3)$, $P(0{\cdot}5, 3{\cdot}7)$ and $P(1{\cdot}0, 3{\cdot}8)$, firstly because the observed differences between the actual values of B_1 and B_2 and the difference formulae values were only slight; and secondly because Diagrams XI and XII, to be studied in connection with the results contained in Table VI, did not appear to justify the labour involved in calculating this additional series of "actual" curves†. We shall return to these diagrams later.

* It will be observed that in $P(0, 2{\cdot}5)$, $P(0, 4{\cdot}1)$, etc. the values of β_1 and β_2 are indicated correctly to the first decimal place only, the true values being those given in the table above. E.g. instead of $P(0{\cdot}492,087; 3{\cdot}724,935)$ we write $P(0{\cdot}5, 3{\cdot}7)$.

† In the case of $P(0{\cdot}22, 3{\cdot}16)$ Church fitted VI (N. F) (actual) as well as VI (N. F) (diff. form.) and obtained a close agreement between the two fits.

3. *The Theoretical Values of the Moment Coefficients of $D(s^2)$.*

The population constants, tabulated in the previous section, were substituted directly in equations (1)—(4) to give the theoretical values of the moment coefficients of $D(s^2)$. The means and standard deviations given below in Table V (a) are therefore expressed in the same units as those of the population variances in Table IV (a); the square root of any population variance indicating, of course, the number of population grouping units in the population σ‡.

TABLE V (a).

Moment Coefficients of $D(s^2)$, using Difference Formulae Values of β_3, β_4 and β_6.

		$P(0, 2{\cdot}5)$	$P(0, 4{\cdot}1)$	$P(0{\cdot}2, 3{\cdot}3)$	$P(0{\cdot}5, 3{\cdot}7)$	$P(1{\cdot}0, 3{\cdot}8)$
$n=5$	Mean	32·070,400	25·760,480	20·062,032	20·060,926	122·422,666
	$\sigma_{s^2}^2$	20·294,801	21·908,443	14·994,938	16·111,147	99·970,067
	B_1 (diff. form.)	1·036,781	7·631,410	2·943,551	4·2966*	2·864,939
	B_2 (diff. form.)	4·203,884	29·389,150	8·057,625	10·8571*	7·044,003
	Type	I	IV	VI	VI	I
$n=10$	Mean	36·079,200	28·980,540	22·569,786	22·568,542	137·725,499
	$\sigma_{s^2}^2$	14·982,776	16·745,373	11·319,755	12·251,948	76·140,919
	B_1 (diff. form.)	0·422,863	3·879,790	1·383,055	2·086,352	1·294,816
	B_2 (diff. form.)	3·475,923	17·323,790	5·420,368	6·877,610	4·778,311
	Type	I	IV	VI	VI	I
$n=20$	Mean	105·625,180	30·590,570	42·300,124	23·822,350	145·376,916
	$\sigma_{s^2}^2$	29·926,423	12·277,714	14·665,631	8·961,445	55·732,873
	B_1 (diff. form.)	0·191,260	1·959,700	0·678,428	1·0298*	0·614,520
	B_2 (diff. form.)	3·212,112	10·447,870	4·199,272	4·9268*	3·829,640
	Type	I	IV	VI	VI	I

	$P(0, 7{\cdot}1)$			$P(1{\cdot}2, 5{\cdot}8)$	
	$n=5$	$n=10$	$n=20$	$n=5$	$n=25$
Mean	33·330,240	37·496,520	39·579,660	20·197,061	24·236,473
$\sigma_{s^2}^2$	38·155,247	29·701,981	21·961,687	20·811,385	10·721,317
B_1 (diff. form.)	—	—	—	23·586,900	5·109,187
B_2 (diff. form.)	—	—	—	88·041,130	21·973,751
Type	—	—	—	VI	IV

* "Sophister's" values. *Biometrika*, Vol. xx^A. p. 399.

‡ E.g. From Table IV (a) we have $\sigma^2 = 32{\cdot}2006$ for $P(0, 4{\cdot}1)$. Hence there are 5·6746 population grouping units in the standard deviation, and for samples of n we have $M_1' = 32{\cdot}2006\left(\frac{n-1}{n}\right)$, and

$$\sigma_{s^2} = 32{\cdot}2006\,\frac{\left(1-\frac{1}{n}\right)}{n^{\frac{1}{2}}}\sqrt{3{\cdot}116,472+\frac{2}{n-1}}.$$

TABLE V (*b*).

Moment Coefficients of $D(s^2)$, using Actual Values of β_3, β_4 and β_6.

		$P(0, 4{\cdot}1)$	$P(0, 7{\cdot}1)$	$P(1{\cdot}2, 5{\cdot}8)$
Samples of 5	B_1 (actual)	5·99046	29·52538	14·743,480
	B_2 (actual)	14·30208	58·94594	30·187,540
	Type	VI	J_{VI}	J_{VI}
Samples of 10	B_1 (actual)	2·95374	15·29983	—
	B_2 (actual)	8·61764	31·69888	—
	Type	VI	J_{VI}	—
Samples of 20	B_1 (actual)	1·47040	7·77625	—
	B_2 (actual)	5·80575	17·51721	—
	Type	VI	VI	—
Samples of 25	B_1 (actual)	—	—	3·049,403
	B_2 (actual)	—	—	8·560,916
	Type	—	—	VI

4. *Pearson Curves fitted from the $D(s^2)$ Constants.*

The actual law of the sampling distribution of the variance is so far only known in the case of the normal parent population. In all other cases we only know the first four-moment coefficients of $D(s^2)$ in terms of the population constants, and as stated before it is our object to find whether Pearson curves, fitted from the moment constants of $D(s^2)$, can describe the distribution effectively; and also to determine, as far as possible, which method of fitting is the most reliable. We shall fit

(i) Non-fixed start curves, from four moments,

(*a*) Using the difference formulae to obtain B_1 and B_2.

(*b*) Using the actual higher moment coefficients of the parent population to find B_1 and B_2.

For these curves it is perhaps best to use the Type I, Type VI, and Type IV equations in their usual forms.

(ii) Fixed-start curves, from three moments,

(*a*) Using B_1 (diff. form.).

(*b*) Using B_1 (actual).

In these cases we shall use I (F) and VI (F) in the forms of equations (6) and (5) respectively.

(iii) Type III curves with fixed start, using only the mean and second moment coefficient of $D(s^2)$. These involve only σ^2 and B_2 of the population, and the size n of the sample. Equation (21) is the one to be used.

(iv) The Type III curve of the "normal theory" which is (21) *bis*.

In the present section we shall deal with points of general interest in connection with the different curves. This will then be followed up in Section (5) by a discussion of the tests of goodness of fit.

The moment coefficients of $D(s^2)$ were seen to lead to J-shaped curves in certain cases. In a few others also it was clear that the resulting curves could not fit the experimental data. The grouped observations, the different theoretical distributions, as well as the result of the χ^2 tests for curves actually completed are exhibited in Table VI (pp. 166—175).

The procedure to be followed in the case of our non-fixed start curves, whether they be "difference formulae" or "actual higher moment" curves, can be illustrated by referring to, say $P(0, 2{\cdot}5)$. Table III shows that two different groupings of the population frequencies were made, one for $n = 5$ and 10, and another for $n = 20$. Corresponding to these, Table IV (a) therefore contains two sets of population constants. For both sets the higher betas have been deduced straightforwardly from the difference formulae and have been used to find B_1 (diff. form.) and B_2 (diff. form.). Referring now to Table IV (a) we have for $n = 5$ and $n = 10$ the following population constants: $\sigma^2 = 40{\cdot}088$; $\beta_1 = 0 = \beta_3$; $\beta_2 = 2{\cdot}502{,}308$; $\beta_4 = 8{\cdot}950{,}965$; $\beta_6 = 39{\cdot}241{,}904$. These constants were substituted in equations (1)—(4) without any change of units, and for $n = 5$ gave $M_1' = 32{\cdot}0704$; $\sigma_{s^2} = 20{\cdot}294{,}801$; $B_1 = 1{\cdot}036{,}781$; $B_2 = 4{\cdot}203{,}884$—the values contained in Table V (a). A Type I curve with these four-moment coefficients was then fitted to the observations in the ordinary way. The resulting frequencies are given in Table VI in the column headed I (N.F). The grouping of these frequencies for the χ^2 test is indicated in the same column by curled brackets. The fixed start curve has of course the same values of M_1', σ_{s^2} and B_1 as the corresponding four-moment fit but its equation is most easily calculated by using equations (13) and (14); and either (7), (8), (9), (10) or (7)*bis*, (8)*bis*, (11), (12) as the case may be. The value of M_1' already obtained will again be needed; e.g. for $n = 10$, $P(0, 2{\cdot}5)$ we find $\gamma_1 = 1{\cdot}172{,}4530$, $\gamma_2 = 1{\cdot}333{,}8948$. Hence $m_1 = -23{\cdot}615{,}9134$, $m_2 = 3{\cdot}707{,}2823$, from which b and $\log y_0$ can be calculated. Equation (6) is used because $m_1 - m_2 - 2$ is negative. The actual frequencies for all our curves were found by computing mid-ordinates and applying the appropriate corrections. The frequencies for the curve under consideration are given in the column headed I (F) in Table VI, the grouping for the χ^2 test being indicated as before. The III (F) curve of equation (21) and the "normal theory" curve of (21)*bis* present no difficulties. It will be seen that for $P(0, 2{\cdot}5)$ twelve curves have been fitted in all, four for each of $n = 5$, $n = 10$ and $n = 20$.

$P(0, 4{\cdot}1)$. In this case a greater variety of $D(s^2)$ curves was examined. For $n = 5$, 10 and 20 the non-fixed start curves with B_1 (diff. form.) and B_2 (diff. form.) were, however, of Type IV. These curves failed rather badly to fit the observations. The results are therefore not given, but figures (I) and (II) in Diagram IX depict the curves for samples of 5 and 20 respectively. For comparison the fixed start curves VI (F) (actual) are also shown. The non-fixed start curves with B_1 (actual) and B_2 (actual), on the other hand, were satisfactory for $n = 10$ and $n = 20$, but in the case of $n = 5$, where low values of s^2 are very frequent, the curve started so badly that

DIAGRAM IX.

DISTRIBUTIONS OF VARIANCE.

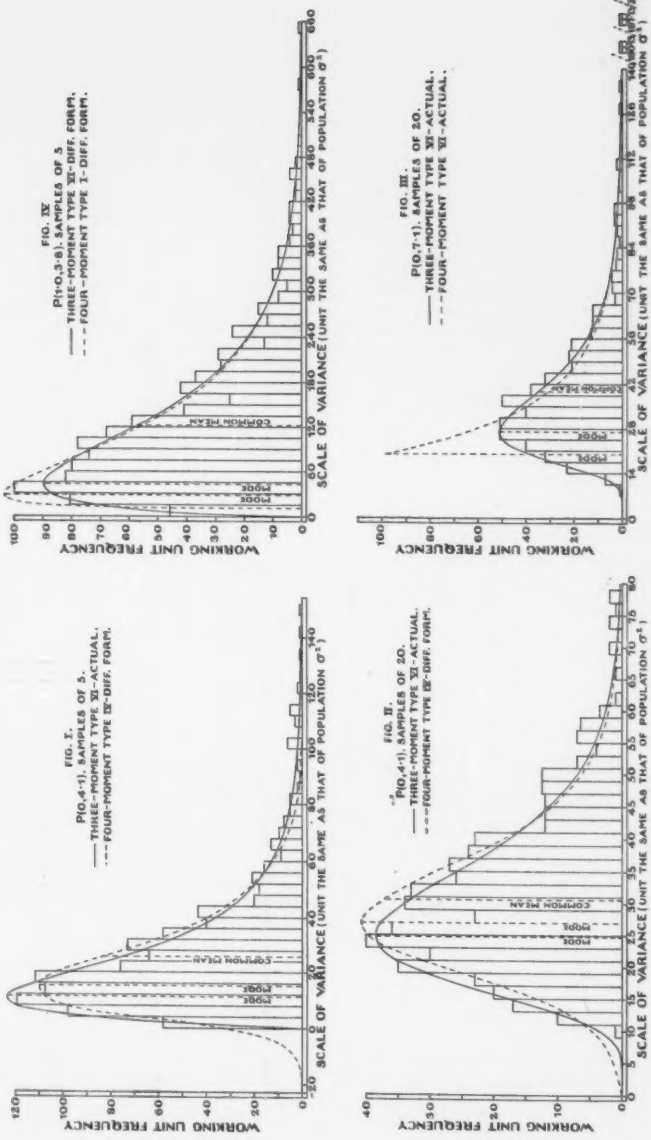


FIG. IX
P(+0.3-8). SAMPLES OF 3.
—— THREE-MOMENT TYPE XII-DIFF. FORM.
- - - FOUR-MOMENT TYPE I-DIFF. FORM.
WORKING UNIT FREQUENCY
SCALE OF VARIANCE (UNIT THE SAME AS THAT OF POPULATION σ²)
MODE
COMMON MEAN
FIG. III.
P(0.7-1). SAMPLES OF 20.
—— THREE-MOMENT TYPE XII-ACTUAL.
- - - FOUR-MOMENT TYPE XII-ACTUAL.
FIG. I.
P(0.4-1). SAMPLES OF 5.
—— THREE-MOMENT TYPE XII-ACTUAL.
- - - FOUR-MOMENT TYPE IX-DIFF. FORM.
FIG. II.
P(0.4-1). SAMPLES OF 20.
—— THREE-MOMENT TYPE XII-ACTUAL.
- - - FOUR-MOMENT TYPE IX-DIFF. FORM.

TABLE VI.

Showing Observed and Theoretical Distributions of s^2 for the Populations Sampled.*

P (0, 2·5), $n=5$						P (0, 2·5), $n=10$					
s^2 (Central values)	Observed	Normal Theory	III (F)	I (N.F)	I (F)	s^2 (Central values)	Observed	Normal Theory	III (F)	I (N.F)	I (F)
1·5	9	15·5	6·8	14·4†	11·9	1	—	1·4	·3	1·0	·7
4·5	28	39·3	25·7	32·0	32·4	3	1				
7·5	49	54·6	43·7	46·2	47·4	5	—				
10·5	65	63·5	57·3	56·3	57·5	7	—	2·8	1·1	1·9	1·8
13·5	68	67·7	66·1	62·7	63·6	9	6	5·3	2·6	3·7	3·6
16·5	72	68·7	70·8	66·1	66·6	11	6	8·2	5·0	6·0	6·0
19·5	62	67·4	72·0	67·0	67·2	13	16	11·5	8·0	8·8	8·9
22·5	58	64·5	70·6	66·0	65·9	15	9	14·8	11·5	11·9	12·1
25·5	59	60·6	67·5	63·6	63·3	17	15	17·8	15·2	15·1	15·4
28·5	46·5	56·2	63·1	60·1	59·8	19	24·5	20·5	18·8	18·2	18·5
31·5	49·5	51·5	58·0	56·1	55·7	21	15·5	22·7	22·0	21·0	21·2
34·5	61·5	46·8	52·7	51·6	51·3	23	19·5	24·3	24·7	23·4	23·6
37·5	54·5	42·2	47·2	47·0	46·7	25	32·5	25·4	26·8	25·3	25·4
40·5	57	37·8	42·0	42·4	42·1	27	26	25·9	28·1	26·6	26·6
43·5	31	33·7	37·0	37·9	37·7	29	29	25·9	28·7	27·3	27·3
46·5	39	29·9	32·4	33·6	33·5	31	21	25·5	28·6	27·5	27·4
49·5	33	26·4	28·1	29·6	29·5	33	29	24·7	28·0	27·2	27·1
52·5	20	23·2	24·3	25·9	25·8	35	27	23·7	27·0	26·4	26·3
55·5	18	20·3	20·9	22·5	22·5	37	22·5	22·4	25·5	25·3	25·1
58·5	18	17·8	17·9	19·4	19·4	39	23·5	21·0	23·8	23·9	23·7
61·5	12	15·5	15·3	16·6	16·7	41	22·5	19·5	22·0	22·2	22·1
64·5	8·5	13·5	13·0	14·2	14·3	43	16·5	18·0	20·0	20·5	20·4
67·5	20·5	11·7	11·0	12·0	12·2	45	17·5	16·4	18·1	18·6	18·6
70·5	12	10·1	9·3	10·2	10·2	47	16·5	14·9	16·1	16·8	16·8
73·5	8	8·8	7·9	8·5	8·6	49	13	13·4	14·3	15·0	15·0
76·5	8	7·6	6·6	7·1	7·2	51	18	12·0	12·6	13·2	13·3
79·5	1	6·5	5·5	5·9	6·0	53	10	10·7	11·0	11·6	11·6
82·5	2	5·6	4·6	4·9	4·9	55	10	9·5	9·5	10·1	10·2
85·5	7	4·8	3·9	4·0	4·1	57	10	8·4	8·2	8·7	8·7
88·5	2	4·1	3·2	3·3	3·3	59	8·5	7·4	7·0	7·4	7·5
91·5	4	3·6	2·7	2·7	2·7	61	6·5	6·5	5·9	6·3	6·4
94·5	5					63	2	5·7	5·0	5·3	5·4
97·5	2	7·8	5·6	5·3	5·4	65	4	4·9	4·2	4·4	4·4
100·5	1					67	6	4·3	3·6	3·7	3·7
103·5	1					69	3	3·7	3·0	3·1	3·1
106·5	1	4·9	3·2	2·7	2·7	71	3				
109·5	1					73	3	8·2	6·2	6·1	6·2
112·5	2					75	2				
115·5	1					77	1				
118·5	1					79	2	5·2	3·4	3·2	3·2
121·5	—	7·9	4·1	2·2	2·0	81	1				
124·5	1					83	1				
127·5	—					84	0	7·5	4·2	3·3	2·7
130·5	—										
133·5	—										
136·5	1										
Total	1000	1000	1000	1000	1000	Total	500	500	500	500	500
No. of groups		27	27	27	27	No. of groups		26	26	26	26
χ^2		45·356	43·739	39·709	38·093	χ^2		18·907	16·801	13·909	13·636
P		·011	·016	·042	·059	P		·802	·889	·949	·954

* The central values of s^2 in this Table are all expressed in the same units as the population variances given in Table IV (*a*). The brackets in the observational columns indicate the observed equivalents of the theoretical frequencies on their right; those in all other columns indicate the grouping for the χ^2 test.

† ·5 of this falls outside the 1st group.

TABLE VI (*continued*).

P (0, 2·5), n=20						P (0, 4·1), n=5					
s^2 (Central values)	Observed	Normal Theory	III (F)	I (N.F)	I (F)	s^2 (Central values)	Observed	Normal Theory	III (F)	VI (F) diff. form.	VI (F) actual
32·5	—	3·4	1·2	1·9	1·7	2	58	39·3	83·7	41·8	50·6
37·5	—					6	98	89·6	113·1	104·3	107·8
42·5	—	3·7	1·7	2·2	2·2	10	119·5	110·2	111·4	125·7	122·4
47·5	3	6·1	3·3	3·0	3·9	14	107·5	113·4	102·4	121·7	117·3
52·5	7	9·0	5·8	6·4	6·4	18	111·5	107·1	91·0	108·7	104·2
57·5	7	12·5	9·1	9·5	9·6	22	76	96·1	79·2	92·2	89·0
62·5	14·5	16·1	13·1	13·2	13·3	26	64	83·3	68·1	76·1	74·2
67·5	19·5	19·8	17·6	17·2	17·3	30	73	70·5	58·1	61·9	61·1
72·5	17	23·1	22·1	21·3	21·5	34	58	58·6	49·2	50·0	49·9
77·5	30	26·0	26·3	25·2	25·3	38	40	48·0	41·4	40·3	40·6
82·5	31	28·2	29·8	28·6	28·7	42	43·5	38·9	34·8	32·4	33·0
87·5	26	29·7	32·4	31·2	31·2	46	20	31·2	29·1	26·1	26·7
92·5	33	30·4	34·0	32·9	32·9	50	18	24·9	24·1	21·0	21·7
97·5	39	30·3	34·5	33·7	33·6	54	21	19·7	20·0	17·0	17·6
102·5	34	29·6	33·9	33·4	33·3	58	16	15·5	16·6	13·8	14·4
107·5	27	28·3	32·4	32·3	32·2	62	9	12·2	13·8	11·2	11·7
112·5	26	26·5	30·3	30·5	30·4	66	13	9·5	11·4	9·2	9·6
117·5	30	24·5	27·6	28·1	28·0	70	9·5	7·4	9·4	7·5	7·9
122·5	25	22·3	24·7	25·4	25·3	74	7·5	5·7	7·7	6·2	6·5
127·5	18	20·0	21·7	22·4	22·4	78	5	4·4	6·4	5·1	5·4
132·5	30	17·7	18·7	19·4	19·4	82	5	3·4	5·2	4·2	4·4
137·5	16	15·4	15·8	16·5	16·5	86	2	2·6	4·3	3·5	3·7
142·5	12	13·3	13·2	13·8	13·9	90	1	2·0	3·5	2·9	3·1
147·5	8	11·4	10·9	11·4	11·4	94	2	1·5	2·9	2·5	2·6
152·5	12	9·7	8·9	9·2	9·2	98	2				
157·5	3	8·1	7·1	7·3	7·4	102	6	2·8	5·9	5·4	5·4
162·5	10	6·8	5·6	5·8	5·8	106	—				
167·5	2	5·6	4·4	4·5	4·5	110	3				
172·5	2	4·6	3·4	3·4	3·4	114	5	1·2	3·3	3·3	3·3
177·5	3	3·7	2·6	2·6	2·6	118	—				
182·5	6	3·0	2·0	1·9	1·9	122	2				
187·5	5					126	1				
192·5	1	5·8	3·5	3·1	3·1	130	—				
197·5	1					134	1				
202·5	—					138	—	1·0	4·0	6·0	5·9
207·5	1	5·4	2·4	1·7	1·7	142	1				
212·5	1					146	—				
						150	1				
Total	500	500	500	500	500	Total	1000	1000	1000	1000	1000
No. of groups		21	21	21	21	No. of groups		19	20	20	20
χ^2		26·962	14·237	15·395	15·272	χ^2		54·298	37·870	30·618	23·682
P		·136	·818	·753	·761	P		·000	·006	·044	·209

TABLE VI (*continued*).

P (0, 4·1), n=10							P (0, 4·1), n=20						
s^2 (Central values)	Observed	Normal Theory	III (F)	VI (F) diff. form.	VI (F) actual	VI (N.F) actual	s^2 (Central values)	Observed	Normal Theory	III (F)	VI (F) diff. form.	VI (F) actual	VI (N.F) actual
1·25	—	·1	1·2	·1	·1	·1	1	—					
3·75	—	1·5	6·7	1·3	2·4	1·0	3	—					
6·25	6	5·8	14·2	6·6	8·8	7·8	5	—	·2	2·4	·3	·6	·5
8·75	14	12·6	21·4	16·0	17·9	18·3	7	—					
11·25	37	20·5	27·3	26·2	27·8	28·1	9	1	1·0	4·5	1·3	2·1	2·0
13·75	27·5	28·0	31·5	34·6	33·9	35·2	11	4	3·0	8·3	4·2	5·5	5·4
16·25	40·5	34·1	34·0	39·8	38·1	39·1	13	13	6·6	13·2	9·6	10·9	10·9
18·75	36	38·1	34·9	41·7	39·8	40·3	15	15	11·9	18·5	16·9	17·6	17·7
21·25	53	40·1	34·6	41·2	39·3	39·4	17	31	18·4	23·7	24·7	24·6	24·7
23·75	35·5	40·2	33·4	38·9	37·3	37·2	19	22	25·4	28·2	31·7	30·7	30·8
26·25	28·5	38·7	31·5	35·5	34·2	34·1	21	35·5	32·0	31·6	36·7	35·1	35·2
28·75	35	36·1	29·2	31·7	31·0	30·7	23	33·5	37·2	33·8	39·5	37·7	37·8
31·25	27	32·8	26·6	27·8	27·5	27·2	25	42	40·6	34·8	40·0	38·4	38·4
33·75	33	29·1	24·0	24·1	24·1	23·8	27	29	42·0	34·6	38·8	37·5	37·5
36·25	17	25·4	21·4	20·7	20·9	20·6	29	24	41·4	33·5	36·2	35·4	35·4
38·75	15·5	21·7	18·8	17·6	17·9	17·7	31	40	39·2	31·6	32·9	32·6	32·5
41·25	16·5	18·4	16·5	14·9	15·3	15·2	33	25	35·9	29·2	29·2	29·3	29·2
43·75	11	15·3	14·3	12·6	13·0	12·9	35	22	31·8	26·4	25·5	25·8	25·8
46·25	13	12·5	12·4	10·6	11·0	11·0	37	31	27·4	23·5	22·0	22·4	22·4
48·75	13	10·3	10·6	9·0	9·3	9·3	39	24	23·0	20·6	18·7	19·2	19·2
51·25	4	8·3	9·1	7·5	7·9	7·9	41	17	19·0	17·8	15·8	16·3	16·3
53·75	7	6·7	7·7	6·3	6·6	6·7	43	10·5	15·3	15·2	13·2	13·7	13·7
56·25	4	5·3	6·5	5·3	5·6	5·6	45	14·5	12·1	12·9	11·0	11·5	11·5
58·75	3	4·2	5·5	4·5	4·7	4·7	47	8	9·4	10·8	9·1	9·5	9·5
61·25	5	3·3	4·6	3·8	4·0	4·0	49	14	7·2	8·9	7·5	7·9	7·9
63·75	3	2·6	3·8	3·2	3·3	3·4	51	12	5·4	7·3	6·2	6·5	6·5
66·25	2	2·0	3·2	2·7	2·8	2·8	53	4	4·1	5·9	5·1	5·3	5·3
68·75	1	1·5	2·7	2·3	2·4	2·4	55	8	3·0	4·8	4·3	4·4	4·4
71·25	2						57	3	2·2	3·9	3·4	3·6	3·6
73·75	4	2·8	5·5	4·9	5·1	5·2	59	7	1·6	3·1	2·8	2·9	2·9
76·25	2						61	1					
78·75	1						63	1	2·5	5·8	5·8	5·9	5·9
81·25	1	1·2	3·0	3·1	3·1	3·1	65	—					
83·75	—						67	1					
86·25	—						69	1	·9	2·8	3·3	3·1	3·1
88·75	1						71	1					
91·25	—						73	1					
93·75	—	·8	3·9	5·5	4·9	5·2	75	2	·3	2·4	4·3	4·0	4·0
96·25	—						77	2					
98·75	—												
101·25	—												
103·75	1												
Total	500	500	500	500	500	500	Total	500	500	500	500	500	500
No. of groups		19	20	20	20	20	No. of groups		19	21	21	21	21
χ^2		35·441	37·733	18·447	19·879	19·301	χ^2		70·440	26·080	32·354	27·946	27·979
P		·008	·006	·493	·402	·438	P		·000	·163	·040	·111	·110

TABLE VI (*continued*).

P (0, 7·1), $n=5$			P (0, 7·1), $n=10$				P (0, 7·1), $n=20$		
s^2 (Central values)	Observed	VI (F) actual	s^2 (Central values)	Observed	VI (F) actual	III (F)	s^2 (Central values)	Observed	VI (F) actual
2	40·5	65·4	1·5	—	·3	·2	·75	—	1·1
6	111·5	102·9	4·5	8	4·3	21·9	5·25	—	
10	98	105·0	7·5	16·5	13·6	26·2	8·75	1	7·6
14	99·5	96·7	10·5	23·5	24·0	28·3	12·25	7	21·4
18	97·5	85·4	13·5	27·5	31·9	28·9	15·75	23	36·4
22	83·5	73·9	16·5	31·5	36·4	28·7	19·25	32	46·6
26	55·5	63·4	19·5	38	37·8	27·9	22·75	40	50·5
30	55·5	54·1	22·5	38	37·0	26·7	26·25	51	49·4
34	38·5	46·1	25·5	40·5	34·9	25·3	29·75	51	45·3
38	49	39·3	28·5	26·5	32·1	23·8	33·25	40	39·8
42	38	33·6	31·5	32	39·0	22·3	36·75	50	34·0
46	36·5	28·7	34·5	35	25·8	20·7	40·25	38	28·6
50	22	24·6	37·5	24	22·8	19·1	43·75	32	23·7
54	17·5	21·2	40·5	21	20·1	17·6	47·25	21	19·6
58	24	18·3	43·5	17	17·6	16·2	50·75	22	16·1
62	10	15·8	46·5	14	15·4	14·8	54·25	21	13·2
66	10	13·7	49·5	16	13·5	13·6	57·75	13	10·9
70	12	12·0	52·5	14·5	11·8	12·4	61·25	12	9·0
74	11	10·4	55·5	10	10·3	11·2	64·75	12	7·4
78	10	9·1	58·5	8·5	9·0	10·2	68·25	3	6·1
82	7	8·0	61·5	4	7·9	9·3	71·75	4	5·1
86	8	7·1	64·5	6	6·9	8·4	75·25	4·5	4·2
90	10	6·2	67·5	4	6·1	7·6	78·75	2·5	3·5
94	7	5·5	70·5	4	5·3	6·8	82·25	2	2·9
98	4	4·9	73·5	5	4·7	6·2	85·75	1	2·5
102	3	4·4	76·5	3	4·2	5·6	89·25	2	2·1
106	4	3·9	79·5	2	3·7	5·0	92·75	3	1·8
110	5	3·5	82·5	3	3·3	4·5	96·25	3	3·9
114	8	3·1	85·5	1	2·9	4·1	99·75	—	
118	2	2·8	88·5	1	2·6	3·6	103·25	1	
122	2	2·5	91·5	1	2·3	3·3	106·75	1	
126	4	2·3	94·5	1	2·0	2·9	110·25	2	
130	—	2·1	97·5	2	1·8	2·6	113·75	—	
134	2	1·9	100·5	—	1·6	2·4	117·25	—	
138	1		103·5	—	1·5	2·1	120·75	—	
142	2	5·9	106·5	3	1·3	1·9	124·25	—	
146	—		109·5	—	1·2	1·7	127·75	1	
150	1		112·5	1	1·1	1·5	131·25	—	
154	1		115·5	4	1·0	1·4	134·75	1	
158	1		118·5	—			⋮	—	
162	—	5·0	121·5	3				—	
166	1		124·5	—	3·7	5·0	190·75	1	
170	1		127·5	2			⋮	—	
174	1		130·5	—				—	
⋮	—		133·5	1			197·75	1	
190	1	4·5	136·5	—			⋮	—	
⋮	—		139·5	1	2·3	2·7		—	
202	1		142·5	1			208·25	1	
⋮	—		145·5	2					
266	1		⋮	—					
⋮	—	6·8	175·5	1					
442	1		⋮	—					
⋮	—		202·5	1	5·0	3·4			
634	1		⋮	—					
			337·5	1					
Total	1000	1000	Total	500	500	500	Total	500	500
No. of groups		26	No. of groups		23	24	No. of groups		18
χ^2		36·138	χ^2		16·154	74·480	χ^2		9·929
P		·070	P		·808	·000	P		·907

TABLE VI (*continued*).

P (0·2, 3·3), $n=5$						P (0·2, 3·3), $n=10$					
s^2 (Central values)	Observed	Normal Theory	III (F)	VI (N.F)	VI (F)	s^2 (Central values)	Observed	Normal Theory	III (F)	VI (N.F)	VI (F)
1·5	42	36·7	47·8	39·9*	38·0	1	—	1·8	3·1	2·3	1·9
4·5	85	84·6	92·7	87·7	89·1	3	2				
7·5	106	105·2	106·9	108·5	109·7	5	6	6·4	8·7	7·2	7·0
10·5	133	109·5	107·0	111·7	112·2	7	12	13·7	16·5	14·9	15·0
13·5	106	104·6	100·0	105·1	105·2	9	13	22·0	24·4	23·6	23·9
16·5	80·5	94·9	89·7	94·0	93·8	11	33	29·8	31·1	31·4	31·7
19·5	64·5	83·2	78·4	81·3	81·0	13	39	35·9	36·0	37·1	37·4
22·5	72·5	71·2	67·2	68·8	68·5	15	36	39·8	38·7	40·4	40·5
25·5	46·5	59·9	56·8	57·3	57·0	17	51	41·4	39·5	41·3	41·3
28·5	44·5	49·6	47·4	47·1	47·0	19	39	41·0	38·7	40·3	40·2
31·5	29·5	40·7	39·3	38·5	38·4	21	38	39·1	36·7	37·9	37·7
34·5	38·5	33·1	32·3	31·3	31·2	23	39	36·1	33·8	34·6	34·4
37·5	31·5	26·6	26·4	25·3	25·2	25	28	32·4	30·5	30·8	30·6
40·5	15	21·3	21·5	20·4	20·3	27	39	28·5	27·0	26·9	26·8
43·5	23	17·0	17·4	16·4	16·4	29	26	24·6	23·5	23·1	23·0
46·5	18·5	13·5	14·0	13·1	13·1	31	18	20·8	20·1	19·6	19·5
49·5	10·5	10·6	11·3	10·5	10·6	33	13	17·3	17·0	16·4	16·4
52·5	7	8·4	9·0	8·4	8·5	35	13	14·3	14·3	13·6	13·6
55·5	7	6·6	7·2	6·8	6·8	37	8	11·7	11·8	11·2	11·2
58·5	9	5·1	5·8	5·4	5·4	39	9	9·4	9·7	9·2	9·2
61·5	1	4·0	4·6	4·3	4·4	41	10	7·6	7·9	7·5	7·5
64·5	4	3·1	3·6	3·5	3·5	43	6	6·0	6·4	6·1	6·1
67·5	4					45	3	4·7	5·2	4·9	4·9
70·5	2	5·7	7·0	7·1	7·1	47	1	3·7	4·1	3·9	4·0
73·5	3					49	4	2·9	3·3	3·2	3·2
76·5	6					51	3				
79·5	2	2·7	3·4	3·7	3·7	53	3	5·2	6·3	6·1	6·2
82·5	1					55	2				
85·5	—					57	—				
88·5	—					59	2	2·3	3·1	3·1	3·1
91·5	—	1·6	2·3	2·6	2·6	61	—				
94·5	1					63	1				
97·5	1					65	—	·9	1·5	1·5	1·6
100·5	—					67	—				
103·5	—					69	—				
106·5	1					71	—				
109·5	1					73	—				
112·5	1					75	—				
115·5	—	·6	1·0	1·3	1·3	77	—	·7	1·1	1·9	2·1
118·5	—					79	—				
121·5	1					81	1				
124·5	—					83	1				
127·5	—					85	—				
130·5	1					87	1				
Total	1000	1000	1000	1000	1000	Total	500	500	500	500	500
No. of groups		20	20	20	20	No. of groups		21	21	21	21
χ^2		46·364	33·409	30·981	31·122	χ^2		18·784	23·098	18·856	19·035
P		·000	·022	·041	·039	P		·536	·284	·531	·520

* 0·2 falls outside the first group.

TABLE VI (*continued*).

P (0·2, 3·3), $n=20$						P (0·5, 3·7), $n=5$			
s^2 (Central values)	Observed	Normal Theory	III (F)	VI (N.F)	VI (F)	s^2 (Central values)	Observed	Normal Theory	III (F)
1·25	—					1·5	52	36·7	65·7
3·75	—					4·5	84·5	84·6	102·0
6·25	—	·6	1·3	·9	·7	7·5	111·5	105·2	107·8
8·75	—					10·5	110	109·5	103·1
11·25	3					13·5	95	104·6	94·0
13·75	1	1·6	2·5	2·0	1·9	16·5	101	94·9	83·3
16·25	4	3·7	5·2	4·5	4·4	19·5	87	83·2	72·5
18·75	8	7·1	9·0	8·2	8·3	22·5	57·5	71·2	62·2
21·25	8	11·7	13·7	13·2	13·3	25·5	49·5	59·9	52·8
23·75	26	17·2	18·9	18·8	18·9	28·5	48·5	49·6	44·6
26·25	27	22·9	24·0	24·4	24·6	31·5	38·5	40·7	37·3
28·75	29	28·3	28·6	29·4	29·6	34·5	31·5	33·1	31·1
31·25	27	32·8	32·2	33·3	33·4	37·5	30·5	26·6	25·9
33·75	29	36·0	34·6	35·9	35·9	40·5	22	21·3	21·4
36·25	43	37·7	35·7	36·9	36·9	43·5	11	17·0	17·6
38·75	32	37·9	35·6	36·6	36·5	46·5	11	13·5	14·5
41·25	34	36·8	34·4	35·1	34·9	49·5	11	10·6	11·9
43·75	34	34·6	32·3	32·7	32·6	52·5	10	8·4	9·8
46·25	36	31·7	29·7	29·7	29·6	55·5	6	6·6	8·0
48·75	30	28·3	26·7	26·5	26·4	58·5	7	5·1	6·5
51·25	25	24·7	23·6	23·1	23·1	61·5	3	4·0	5·3
53·75	26	21·1	20·5	19·9	19·9	64·5	6·5	3·1	4·3
56·25	16	17·7	17·5	16·8	16·8	67·5	1·5		3·5
58·75	11	14·6	14·7	14·1	14·1	70·5	3	5·7	2·9
61·25	7	11·9	12·2	11·7	11·7	73·5	3		2·3
63·75	9	9·5	10·0	9·5	9·6	76·5	3		
66·25	6	7·5	8·1	7·7	7·8	79·5	—	2·7	4·6
68·75	7	5·9	6·5	6·2	6·3	82·5	1		
71·25	4	4·6	5·2	5·0	5·0	85·5	1		
73·75	5	3·5	4·1	4·0	4·0	88·5	—		
76·25	4					91·5	—		
78·75	1	6·1	7·6	7·5	7·5	94·5	1	2·2	5·1
81·25	2					97·5	1		
83·75	2					100·5	—		
86·25	—	2·5	3·3	3·6	3·6	103·5	1		
88·75	—								
91·25	2	1·5	2·3	2·8	2·7				
93·75	2								
Total	500	500	500	500	500	Total	1000	1000	1000
No. of groups		21	21	21	21	No. of groups		20	21
χ^2		17·64	16·46	16·12	16·18	χ^2		19·905	18·736
P		·611	·687	·709	·705	P		·400	·539

TABLE VI (*continued*).

P (0·5, 3·7), $n=10$						P (0·5, 3·7), $n=20$			
s^2 (Central values)	Observed	Normal Theory	III (F)	VI (N.F)	VI (F)	s^2 (Central values)	Observed	Normal Theory	III (F)
·8	—	·7	2·8	1·1	1·1	1	—		
2·4	1					3	—	·4	2·2
4·0	3	2·9	6·6	3·9	3·9	5	—		
5·6	12	6·7	11·6	8·8	8·8	7	5	2·7	7·9
7·2	11	11·6	16·6	14·7	14·7	9	13	9·9	19·7
8·8	16	17·0	21·1	20·6	20·6	11	24	24·2	36·4
10·4	36	22·1	24·8	25·6	25·6	13	51	44·6	55·3
12·0	32·5	26·5	27·4	29·3	29·3	15	72	67·6	72·6
13·6	28·5	29·9	29·1	31·7	31·7	17	106	88·0	85·7
15·2	31	32·0	29·9	32·6	32·6	19	99	102·0	93·0
16·8	37·5	33·1	29·8	32·5	32·5	21	104	107·6	94·4
18·4	31·5	33·0	29·2	31·5	31·5	23	95	105·1	90·6
20·0	37	32·2	28·0	29·9	29·9	25	76	96·3	83·1
21·6	16	30·6	26·5	27·8	27·8	27	75	83·5	73·2
23·2	22	28·6	24·7	25·5	25·5	29	49	69·1	62·5
24·8	27	26·2	22·8	23·1	23·1	31	49	54·9	51·8
26·4	24	23·7	20·8	20·8	20·8	33	37	42·1	41·8
28·0	23	21·2	18·8	18·5	18·5	35	39	31·3	33·0
29·6	14	18·7	16·9	16·3	16·3	37	36	22·6	25·6
31·2	8	16·4	15·1	14·4	14·4	39	14	16·0	19·5
32·8	10	14·2	13·4	12·6	12·6	41	12	11·0	14·6
34·4	11·5	12·2	11·8	10·9	10·9	43	9	7·4	10·7
36·0	10	10·4	10·3	9·5	9·5	45	15	4·9	7·8
37·6	11·5	8·8	9·0	8·2	8·2	47	8	3·2	5·6
39·2	6	7·4	7·8	7·1	7·1	49	1		
40·8	7	6·2	6·8	6·1	6·1	51	1	4·2	8·8
42·4	5	5·1	5·8	5·3	5·3	53	5		
44·0	3	4·3	5·0	4·5	4·5	55	1		
45·6	3·5	3·5	4·3	3·9	3·9	57	—	1·0	2·9
47·2	8·5	2·9	3·7	3·3	3·3	59	—		
48·8	—	2·3	3·1	2·8	2·8	61	1		
50·4	2	1·9	2·7	2·4	2·4	63	1		
52·0	2					65	—		
53·6	3	3·8	5·7	5·4	5·4	67	—		
55·2	1					69	1		
56·8	—					71	—		
58·4	2	1·9	3·4	3·4	3·4	73	—	·4	1·3
60·0	—					75	—		
61·6	1					77	—		
63·2	—	2·0	4·7	6·0	6·0	79	—		
64·8	1					81	—		
66·4	1					83	—		
						85	—		
						87	1		
Total	500	500	500	500	500	Total	1000	1000	1000
No. of groups		23	23	23	23	No. of groups		18	20
χ^2		31·766	27·793	22·769	22·788	χ^2		63·805	34·445
P		·082	·183	·415	·414	P		·000	·016

TABLE VI (*continued*)

P (1·0, 3·8), $n=5$						P (1·0, 3·8), $n=10$					
s^2 (Central values)	Observed	Normal Theory	III (F)	I (N.F)	VI (F)	s^2 (Central values)	Observed	Normal Theory	III (F)	I (N.F)	VI (F)
7·5	46	25·5	52·9	21·5	50·0	6	—	·2	1·6	—	1·5
22·5	80·5	61·7	82·0	100·7	81·8	18	12	3·2	10·6	4·7	10·0
37·5	99·5	80·9	88·5	101·2	88·9	30	22	12·0	24·9	23·7	24·2
52·5	82	88·8	87·3	94·3	88·3	42	50	26·0	40·0	42·7	39·6
67·5	80	89·5	82·4	85·6	83·5	54	47	42·1	53·3	57·3	53·2
82·5	74	85·7	75·8	76·6	76·9	66	56	57·3	63·2	67·0	63·5
97·5	78	79·3	68·6	68·0	69·5	78	82	69·5	69·5	72·2	70·0
112·5	68	71·7	61·4	60·0	62·0	90	77·5	77·5	72·3	73·9	73·0
127·5	59	63·6	54·4	52·7	54·8	102	70·5	81·1	72·3	72·8	72·9
142·5	41	55·6	47·8	46·2	48·1	114	70	81·0	70·0	69·6	70·5
157·5	25	48·1	41·9	40·3	41·9	126	62	77·7	66·1	65·2	66·5
172·5	42	41·3	36·4	35·1	36·4	138	57	72·2	61·2	60·0	61·4
187·5	37	35·1	31·6	30·5	31·5	150	56	65·3	55·6	54·3	55·7
202·5	28	29·7	27·3	26·4	27·2	162	37	57·8	49·8	48·6	49·8
217·5	29	25·0	23·6	22·9	23·4	174	39	50·2	44·1	43·0	44·0
232·5	13	20·9	20·3	19·8	20·1	186	43	42·8	38·6	37·7	38·4
247·5	24	17·4	17·4	17·0	17·2	198	28	36·0	33·4	32·8	33·2
262·5	12	14·4	14·9	14·7	14·7	210	23	29·9	28·7	28·3	28·5
277·5	15	12·0	12·8	12·6	12·6	222	23	24·5	24·5	24·2	24·3
292·5	8	9·9	10·9	10·9	10·7	234	25	19·9	20·8	20·7	20·6
307·5	5	8·1	9·3	9·3	9·1	246	23	16·1	17·5	17·5	17·3
322·5	10	6·7	7·9	8·0	7·8	258	21	12·8	14·7	14·7	14·5
337·5	8	5·5	6·8	6·8	6·6	270	15	10·2	12·2	12·4	12·1
352·5	8	4·5	5·7	5·8	5·6	282	13	8·0	10·2	10·3	10·0
367·5	4	3·6	4·9	5·0	4·8	294	10	6·2	8·4	8·6	8·3
382·5	3	3·0	4·1	4·3	4·1	306	7	4·9	6·9	7·1	6·9
397·5	4	2·4	3·5	3·6	3·5	318	4	3·8	5·7	5·8	5·6
412·5	4	2·0	3·0	3·1	2·9	330	2	2·9	4·6	4·8	4·6
427·5	2	1·6	2·5	2·6	2·5	342	8	2·2	3·8	3·9	3·8
442·5	2	1·3	2·1	2·2	2·1	354	2	1·7	3·1	3·2	3·1
457·5	4					366	2				
472·5	2	2·5	4·6	4·9	4·6	378	5	3·0	6·1	6·4	6·2
487·5	—					390	2				
502·5	1					402	1				
517·5	—	1·3	2·8	3·0	2·8	414	1	1·2	3·2	3·4	3·4
532·5	—					426	1				
547·5	—					438	1				
562·5	—					450	—				
577·5	1					462	—				
592·5	—					474	—				
607·5	—	1·4	4·6	4·4	4·8	486	—	·8	3·1	3·2	3·4
622·5	—					498	—				
637·5	—					510	1				
652·5	1					522	—				
						534	1				
Total	1000	1000	1000	1000	1000	Total	1000	1000	1000	1000	1000
No. of groups		23	24	24	24	No. of groups		23	25	25	25
χ^2		63·870	26·143	58·542	25·617	χ^2		108·360	21·746	20·935	21·616
P		·000	·294	·000	·319	P		·000	·594	·643	·602

TABLE VI (*continued*).

P (1·0, 3·8), $n=20$						P (0·22, 3·16), $n=10$*					
s^2 (Central values)	Observed	Normal Theory	III (F)	I (N.F)	VI (F)	s^2 (Central values)	Observed	Normal Theory	III (F)	VI (N.F)	VI (F)
4·5	—					1	1	1·0	1·6	·9	1·1
13·5	—	·2	1·2	·6	1·2	2	1	6·8	8·6	7·0	7·3
22·5	—					3	18	18·6	21·4	19·7	19·7
31·5	3					4	34	34·1	37·0	36·1	35·9
40·5	4	·7	2·6	2·1	2·5	5	66	50·1	52·3	52·5	52·2
49·5	5	2·1	5·5	5·2	5·4	6	67	64·0	65·0	66·2	65·9
58·5	13	4·9	9·5	9·5	9·4	7	74	74·2	73·8	75·6	75·5
67·5	18	9·1	14·2	14·6	14·1	8	80	79·9	78·5	80·4	80·4
76·5	17	14·5	19·2	19·9	19·2	9	62	81·6	79·4	81·1	81·2
85·5	25	20·7	24·1	24·8	24·1	10	85	79·7	77·1	78·4	78·5
94·5	30	26·9	28·2	28·9	28·3	11	71	75·2	72·6	73·4	73·5
103·5	40	32·4	31·4	31·8	31·5	12	61	68·9	66·5	66·8	66·9
112·5	38	36·5	33·4	33·6	33·6	13	67	61·6	59·6	59·5	59·6
121·5	37	39·0	34·3	34·3	34·4	14	51	53·9	52·4	51·9	52·0
130·5	25	39·8	34·1	33·9	34·2	15	48	46·4	45·3	44·7	44·7
139·5	41	39·0	32·9	32·6	33·0	16	34	39·2	38·6	37·9	37·9
148·5	23	36·8	31·1	30·7	31·1	17	33	32·8	32·5	31·8	31·8
157·5	20	33·7	28·7	28·3	28·7	18	34	27·1	27·1	26·4	26·4
166·5	29	30·1	26·0	25·7	26·0	19	26	22·1	22·3	21·7	21·7
175·5	21	26·1	23·2	22·9	23·1	20	22	17·9	18·2	17·7	17·7
184·5	20	22·2	20·3	20·1	20·3	21	8	14·3	14·8	14·4	14·3
193·5	18	18·5	17·6	17·5	17·5	22	14	11·4	11·9	11·6	11·6
202·5	15	15·1	15·0	15·0	15·0	23	7	9·0	9·5	9·3	9·3
211·5	11	12·2	12·7	12·7	12·6	24	7	7·0	7·5	7·4	7·4
220·5	13	9·6	10·6	10·6	10·6	25	5	5·5	6·0	5·9	5·9
229·5	10	7·5	8·8	8·8	8·7	26	4	4·2	4·7	4·7	4·7
238·5	2	5·8	7·2	7·3	7·2	27	2	3·3	3·7	3·7	3·7
247·5	4	4·4	5·9	5·9	5·8	28	5				
256·5	2	3·3	4·7	4·8	4·7	29	—	5·9	6·7	7·0	7·0
265·5	1	2·5	3·8	3·9	3·8	30	5				
274·5	7	1·8	3·0	3·1	3·0	31	1				
283·5	3					32	2	2·5	3·1	3·3	3·3
292·5	1	3·0	5·8	5·9	5·8	33	2				
301·5	2					34	1				
310·5	1					35	1				
319·5	—	1·0	2·7	2·8	2·8	36	—				
328·5	—					37	—	1·8	2·3	3·0	2·9
337·5	1					38	—				
346·5	—	·6	2·3	2·2	2·4	39	—				
355·5	—					40	—				
						41	1				
Total	500	500	500	500	500	Total	1000	1000	1000	1000	1000
No. of groups		19	22	22	22	No. of groups		23	23	23	23
χ^2		64·157	22·068	22·814	22·229	χ^2		27·591	25·835	23·305	23·746
P		·000	·396	·354	·386	P		·190	·259	·385	·361

* Church's Population (B), *Biometrika*, Vol. XVIII. p. 331.

TABLE VI (*continued*).

P (1·2, 5·8), $n=5$					P (1·2, 5·8), $n=25$					
s^2 (Central values)	Observed	VI (N.F) diff. form.	VI (F) diff. form.	VI (F) actual	s^2 (Central values)	Observed	IV diff. form.	VI (N.F) actual	VI (F) diff. form.	VI (F) actual
0·9	8	—	10·6	17·0	·75	—				
2·7	32	—	27·2	31·8	2·25	—				
4·5	35	44·6	35·7	36·8	3·75	—	5·7	—	·2	1·5
6·3	41·5	58·0	38·6	37·5	5·25	—				
8·1	36·5	49·5	38·3	36·2	6·75	2				
9·9	37	42·4	36·2	33·8	8·25	3	4·6	—	1·2	3·9
11·7	31	36·3	33·4	31·1	9·75	10	7·8	5·2	5·2	9·0
13·5	28·5	31·3	30·2	28·2	11·25	14	12·3	16·8	12·8	15·8
15·3	30·5	27·0	27·1	25·4	12·75	29	18·1	27·0	22·2	23·0
17·1	25	23·4	24·1	22·8	14·25	24·5	24·5	33·9	30·9	29·4
18·9	19	20·4	21·4	20·3	15·75	35·5	30·6	37·6	37·1	33·9
20·7	26	17·8	18·9	18·1	17·25	32	35·3	38·7	40·3	36·4
22·5	12	15·5	16·7	16·1	18·75	31	38·1	37·9	40·7	37·1
24·3	14	13·6	14·7	14·4	20·25	32	38·7	35·9	39·1	36·1
26·1	16	12·0	13·0	12·8	21·75	35	37·5	33·2	36·2	34·1
27·9	12	10·6	11·5	11·4	23·25	33	34·8	30·2	32·7	31·4
29·7	16	9·4	10·2	10·2	24·75	23	31·4	27·0	28·9	28·4
31·5	3	8·3	9·0	9·1	26·25	26	27·7	23·9	25·2	25·2
33·3	8	7·4	8·0	8·1	27·75	29	23·9	21·1	21·8	22·2
35·1	7	6·6	7·1	7·3	29·25	25·5	20·4	18·4	18·6	19·3
36·9	4	5·9	6·3	6·5	30·75	15·5	17·2	16·0	15·9	16·7
38·7	7	5·3	5·6	5·8	32·25	17	14·5	13·8	13·5	14·3
40·5	4	4·7	5·0	5·2	33·75	15	12·1	11·9	11·4	12·2
42·3	4	4·2	4·5	4·7	35·25	11	10·1	10·2	9·7	10·4
44·1	4	3·8	4·0	4·2	36·75	8	8·4	8·8	8·2	8·9
45·9	2	3·4	3·6	3·8	38·25	8	7·0	7·5	6·9	7·5
47·7	5	3·1	3·3	3·5	39·75	8	5·9	6·4	5·9	6·4
49·5	2·5	2·8	2·9	3·1	41·25	4	4·9	5·5	5·0	5·4
51·3	3·5	2·6	2·7	2·8	42·75	6	4·4	4·7	4·2	4·6
53·1	2	2·3	2·4	2·6	44·25	2	3·5	4·0	3·6	3·9
54·9	1	2·1	2·2	2·3	45·75	3	2·9	3·4	3·1	3·3
56·7	1	1·9	2·0	2·1	47·25	2	2·5	2·9	2·6	2·8
58·5	4	1·8	1·8	1·9	48·75	2	2·1	2·5	2·2	2·4
60·3	1·5	1·6	1·6	1·8	50·25	1	1·8	2·2	1·9	2·0
62·1	1·5				51·75	—				
63·9	1	4·0	4·1	4·4	53·25	3				
65·7	1				54·75	3	5·6	7·0	6·3	6·5
67·5	1				56·25	—				
69·3	—				57·75	1				
71·1	2				59·25	1				
72·9	3	5·6	5·5	5·9	60·75	1				
74·7	1				62·25	—	2·7	3·2	3·1	3·0
76·5	—				63·75	—				
78·3	1				65·25	—				
80·1	1				66·75	—				
81·9	1				68·25	—				
⋮	—	4·7	4·6	4·9	69·75	—				
92·7	1				71·25	2	3·0	3·2	3·4	3·0
⋮	—				72·75	—				
99·9	1				74·25	—				
⋮	—	6·1	6·0	6·1	75·75	1				
103·5	1									
Total	500	500	500	500	Total	500	500	500	500	500
No. of groups		22	24	24	No. of groups		21	21	21	21
χ^2		39·830	9·917	15·124	χ^2		18·054	18·784	23·898	12·870
P		·008	·992	·890	P		·584	·536	·247	·883

there was clearly no point in completing the calculations. Fixed start curves VI (F) (diff. form.) and VI (F) (actual), as well as III (F) and "normal theory" Type III curves, were fitted for all three sample sizes.

P (0, 7·1). Here the difference formulae could not even be used to obtain β_4. For $n=5$ and $n=10$ the four-moment curves from actual higher moments of the population are J-shaped, whereas the observations do not resemble J-distributions. In the case of $n=20$ VI (N.F) (actual) not only starts very badly, but is almost a J-curve, and cannot therefore fit the experimental D (s^2). This curve and the corresponding fixed start curve are shown in Fig. III, Diagram IX. Only the three VI (F) (actual) curves were fitted for this population; III (F) and "normal theory" curves giving quite impossible fits.

P (0·2, 3·3). Difference formulae values of B_1 and B_2 were used. Although $D(s^2)$ is very skew in the case of $n=5$, the VI (N.F) curve happens to start well. Out of a total frequency of 1000, only 0·2 falls outside the first group. Corresponding to every sample size VI (N.F), VI (F), III (F) and "normal theory" curves have been fitted.

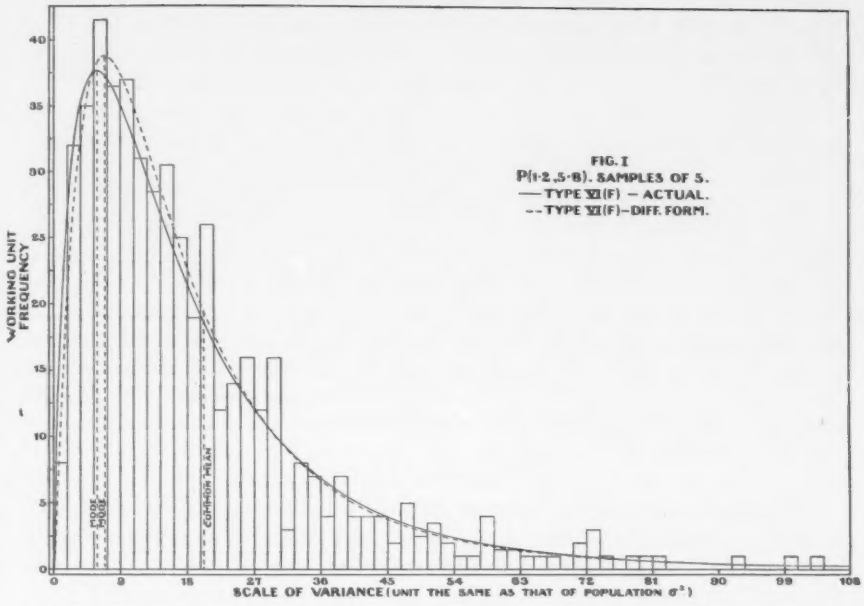
P (0·5, 3·7). This is "Sophister's" population. He fitted the four-moment and three-moment curves for $n=5$ and $n=20$. We shall refer to his results at a later stage. III (F) and "normal theory" curves have been calculated for his samples, and the results entered in Table VI. In addition to this VI (N.F), VI (F), III (F) and "normal theory" curves were computed for $n=10$. In all cases the difference formulae were used to give the higher betas of the population.

P (1·0, 3·8). Here again the difference formulae values of B_1 and B_2 yielded very satisfactory fits. The four-moment curves are of Type I, but when the start is fixed the resulting equations are of Type VI. For every sample size I (N.F), VI (F), III (F) and "normal theory" fits have been found. The I (N.F) curve for $n=5$ starts badly and gives a frequency of only 21·5 in the first group as against 50·0 of the VI (F) curve and 46 of the experiment. It is depicted together with the VI (F) curve in Fig. IV, Diagram IX.

P (1·2, 5·8). As mentioned above, it was found that for certain leptokurtic populations the variance curves obtained by the fixed start method did not, as intended, start at $s^2=0$ for all values of n. I decided therefore to examine one such population experimentally and chose the distribution based on the Type IV curve with $\beta_1=1{\cdot}219{,}224$; $\beta_2=5{\cdot}808{,}791$. With the help of Tippett's Random Sampling Numbers I took 500 samples of 5 and 500 of 25 from this population, calculated the sample variances and grouped the observations. For both $n=5$ and $n=25$, B_1 (diff. form.) and B_2 (diff. form.), as well as B_1 (actual) and B_2 (actual), were calculated. Table V shows that the difference is very considerable. The histogram for $n=5$ is shown in Fig. I, Diagram X. The four-moment curve (diff. form.) is of Type VI; it starts in the third group, and the mid-ordinate corresponding to that group is 65·7 so that the curve is entirely unsatisfactory. The VI (N.F) (actual) curve is a J-curve. Consequently it too cannot represent the observed $D(s^2)$. The VI (F) (actual) and VI (F) (diff. form.) curves, on the other hand, are both very satisfactory

DIAGRAM X.

DISTRIBUTIONS OF VARIANCE.



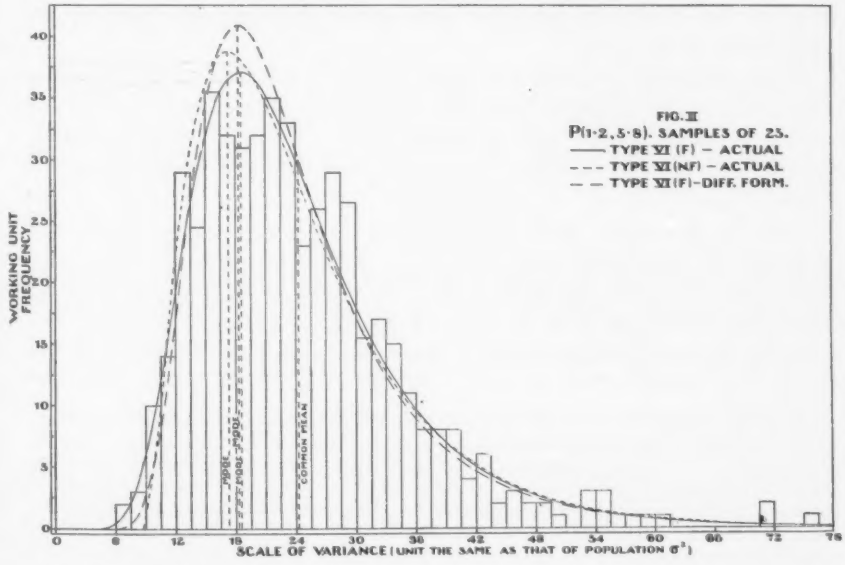


FIG. II
P(1·2,5·8). SAMPLES OF 25.
—— TYPE VI (F) – ACTUAL
– – – TYPE VI (NF) – ACTUAL
– – TYPE VI (F)–DIFF. FORM.
WORKING UNIT FREQUENCY
MODE
MODE
COMMON MEAN
SCALE OF VARIANCE (UNIT THE SAME AS THAT OF POPULATION σ²)

and are shown in the diagram. For $n=25$, however, the four-moment curve (diff. form.) is Type IV whereas the corresponding curve from B_1 (actual) and B_2 (actual) is of Type VI. They show, however, very little difference in the χ^2 tests. The VI (F) (diff. form.) and the VI (F) (actual) curve have also been fitted, but the former, as mentioned above, starts at $s^2=0{\cdot}856$ instead of at zero. These two curves and VI (N.F) (actual) are drawn together in Fig. II, Diagram X.

P (0·22, 3·16). This is Church's population (B), for which he calculated both the VI (N.F) curves, i.e. that based on the difference formulae, as well as that based on actual values of B_1 and B_2*. The population does not deviate much from normality, and so it is interesting to test on it the adequacy of the $D(s^2)$ curve of the "normal theory." In addition to this the population is situated in the neighbourhood of the $D(s^2)$ III line in Diagram VIII, and therefore it was considered worth testing on it the adequacy of the III (F) curve of equation (21). These two Type III curves and the VI (F) curve were calculated from Church's values of the population constants. He obtained his areas for the VI (N.F) curve by using a planimeter; as, however, I wished to treat all the curves in the same way, I recalculated the frequencies for his four-moment equation; and in order that the results of the χ^2 test should be comparable, the frequencies were arranged in 23 groups for all four curves.

5. *Goodness of Fit Tests.*

The values of P obtained from the Goodness of Fit Tests provide a useful guide in making a comparison of the relative merit of the different methods employed to represent the observed distribution of variance. The information obtained from the P's must, however, be supplemented by a careful study of the frequencies of Table VI, and it may be well to emphasize here certain important points regarding the interpretation of the test.

(*a*) If a theoretical law of frequency be the true law, then P's obtained by applying the test to random samples will be equally likely to take any value between 0 and 1, and in the long run will lead to an average value of 0·5. It is therefore of interest to compare the average values of P obtained from different methods of fitting.

(*b*) A change in the arrangement of the grouping of observations may alter the value of P very considerably†. It follows that too much importance need not be attached to a single low value of P. Further, by comparing the individual frequencies it is often possible to see that in one case a high χ^2 is due to irregularly

* For the population constants and $D(s^2)$ moment coefficients, see *Biometrika*, Vol. XVIII. p. 351. On p. 326 of the same paper are given the grouped population frequencies, while the observed $D(s^2)$ is IV (*b*) on p. 331.

† It so happened that for $n=20$, P (0, 4·1), I prepared a second grouping of the observations, having lost the first. Later I recovered the first which is that shown in the histogram in Fig. II, Diagram IX, the second being that exhibited in Table VI. The *size* of the grouping unit employed was exactly the same in the two cases, but the *boundaries* of the groups were at even values of s^2 in the one case and at odd ones in the other. I calculated the χ^2 test for VI (F)—(actual) on both series using 21 corresponding groups. For the one series χ^2 was found to be 27·946 and for the other it was 19·813, leading to P's of ·111 and ·470 respectively.

placed discrepancies which may be attributed to chance sampling fluctuations while in another there is some systematic lack of correspondence suggesting that the theoretical law is incorrect.

(*c*) The test will only indicate whether observed differences are or are not greater than might be expected to arise from chance. If the amount of data is inadequate these chance fluctuations may well obscure a true difference between the real distribution curve, and that which has been fitted. Consequently it may happen that a frequency law may appear adequate when tested on 500 samples, but its weakness may appear when 1000 or more samples are available. This may be one of the reasons why the fits discussed below appear on the whole better in the case of samples of 10 and 20 (for which generally only 500 values of the variance were available) than in that of samples of 5 (for which there are in every case 1000 samples).

The general results of the χ^2 tests exhibited in Table VI are for the observed and theoretical frequencies actually given in that table. Certain of these results have been extracted for comparison in Table VII below. The systems of grouping used are indicated in Table VI by bracketing. For each observational distribution it was possible to keep the same grouping arrangement in calculating P for the three-moment and four-moment methods, and there is often, but not always, correspondence in the case of the III (F) curves. For the normal theory curves, however, a different grouping had generally to be used, because the form of these curves at the tails is often so very different from that of the better fitting curves.

(*a*) *A Comparison of Three-moment Fixed Start and Four-moment Curves for the more Platykurtic Populations.*

For the five populations for which the P's of the χ^2 tests are summarised in Table VII below, the difference formulae alone were used in obtaining the higher moment coefficients required in the calculation of B_1 and B_2. Leaving out of consideration for the moment the III (F) curves, it will be seen that for samples of 10 and 20 there is practically no difference between the results for the fixed start and non-fixed start curves; further that the average value of P is in both cases near to 0·5. A study of Table VI suggests that in these cases the Pearson curves provide a very satisfactory graduation of the observed distributions. The worst fit occurs for $n = 20$ and $P(0{\cdot}5, 3{\cdot}7)$. This is one of "Sophister's" cases, but if Diagram V in his paper is examined it appears, as stated by him, that the discrepancy is due to chance irregularities, not to any systematic difference between observation and theory.

For samples of 5 we note (1) that the values of P are on the whole rather low, (2) that the fits obtained from the three-moment fixed start method are better than those for the four-moment fit. As I had available 1000 samples of 5 in each case, I was able to divide them into two series of 500, and thus calculate two independent values of P. These are shown in brackets in Table VII. It will be seen that the P's based on 500 values of s^2 are on the average considerably greater than

TABLE VII.

n	Method	P (0, 2·5)	P (0·2, 3·3)	P (0·5, 3·7)	P (1·0, 3·8)	P (0·22, 3·16)	Average P
5	3-moment, fixed start	·059 {·419 ·249	·039 {·112 ·591	·883	·319 {·859 ·144	—	·325
	4-moment	·042 {·360 ·209	·041 {·100 ·617	·625	·000	—	·177
	III (F)	·016 {·280 ·214	·022 {·094 ·611	·539	·294 {·811 ·155	—	·218
10	3-moment, fixed start	·954	·520	·414	·602 {·026 ·694	·361	·570
	4-moment	·949	·531	·415	·643 {·046 ·676	·385	·585
	III (F)	·889	·284	·183	·594 {·029 ·683	·259	·442
20	3-moment, fixed start	·761	·705	·099	·386	—	·488
	4-moment	·753	·709	·090	·354	—	·476
	III (F)	·818	·680	·016	·396	—	·478

those based on 1000*. This, as pointed out above, is a result which we might expect to find if the Pearson curves were not in the case of such small samples sufficiently elastic to represent the true variance distributions. An examination of the frequencies in Table VI for samples of 5 suggests that for these more platykurtic populations the three-moment fixed start curves represent the observations well for low values of s^2; but in the two cases P (0, 2·5) and P (0·2, 3·3) it appears, however, that the curves do not allow for sufficient observations *at the other tail*.

(*b*) *The Three-moment Fixed Start Curves for the Three Leptokurtic Populations.*

In several cases which have been described in section four, curves of the four-moment method gave clearly impossible fits. The four of these curves that remain are: (i) for P(0, 4·1), Type VI (N.F) for samples of 10 and 20, based on the actual higher moment coefficients of the population; and (ii) for P(1·2, 5·8), Type VI (N.F) (actual) and Type IV (diff. form.) for $n = 25$. Their distributions are shown in Table VI. Owing, however, to the many failures it is clear that for the more leptokurtic populations the fixed start curves only are to be recommended, at any rate if n is 20 or less. An additional factor, however, now enters into the situation, for we must consider both the $D(s^2)$ fixed start curves based on the actual population moments and those obtained by using the difference formulae. The following table summarises the results of the tests for goodness of fit:

* Note that this is not so in the case of $n = 10$ and P (1·0, 3·8).

n	Higher population moments	$P(0, 4{\cdot}1)$	$P(0, 7{\cdot}1)$	$P(1{\cdot}2, 5{\cdot}8)$
5	Actual values	·209 {·611 ·085	·070 {·266 ·070	·890
	Diff. form. values	·044 {·579 ·015	—	·992
10	Actual values	·402	·808	—
	Diff. form. values	·493	—	—
20	Actual values	·111	·907	$n=25$ {·883 ·247
	Diff. form. values	·110	—	

The average values of P are as follows: "Actual" curves ·535*; "diff. form." curves ·377, so that the use of the difference formulae does not appear to lead to quite such good results as the other method. In the case of $P(0, 7{\cdot}1)$ these formulae of course cannot be applied at all. In three cases the 1000 samples of 5 were broken up into two series of 500, and the results of applying the goodness of fit test to each series are shown in brackets. The P's for the 500 are again on the whole higher than for the 1000, suggesting that the Type VI curves used in these cases are not quite adequate to represent the true variance distribution. For the larger samples the fits appear to be admirable.

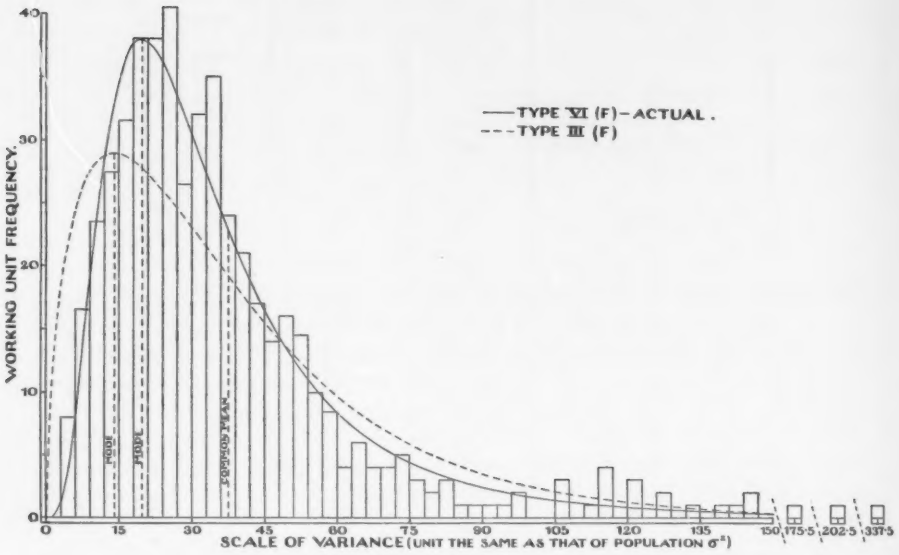
(*c*) *The Type III Curves.*

We shall consider here only Type III curves starting at $s^2 = 0$ (III (F)). These are obtained by using equation (21) and their probability integrals are readily found from the Tables of the Incomplete Gamma Function. As shown above we shall expect these curves to give good fits to $D(s^2)$ from populations whose (β_1, β_2) points lie near what has been termed the $D(s^2)$ III line. Diagram VIII shows that the experimental populations nearest to this line are $P(0{\cdot}22, 3{\cdot}16)$ and $P(1{\cdot}0, 3{\cdot}8)$, and it will be seen from the values of P given in Table VII that in these cases the fit of III (F) is very little worse than that of the three-moment fixed start curves. It is possible to see from the frequencies of Table VI the main points of difference, for these and other populations, between these III (F) and the VI (F) or I (F) curves. This difference lies almost entirely at the abrupt end of the curves; for $P(0, 2{\cdot}5)$ where the fixed start three-moment curve is Type I, the III (F) curve gives *lower* frequencies than the I (F) in the groups near $s^2 = 0$; for all the other cases III (F) gives *higher* frequencies than VI (F) in the first few groups. The worst agreement is in the case of the leptokurtic populations $P(0, 4{\cdot}1)$ and $P(0, 7{\cdot}1)$. For the latter the III (F) curves appear to be quite inadequate, but Diagram XI has been prepared because it strikingly illustrates in the case of $n = 10$ that the

* If the P's corresponding to $P(0, 7{\cdot}1)$ are not taken into account the average P for "actual" curves is ·499 as compared with ·377 for the "diff. form." curves.

DIAGRAM XI.

DISTRIBUTION OF VARIANCE. SAMPLES OF 10 FROM P(0,7·1).



discrepancy again lies mainly at the abrupt end of the curves. At the other end of the distribution, i.e. at the infinite tail, the agreement between VI (F) or I (F) and the III (F) curve is, however, remarkable even in the case of $P(0, 4{\cdot}1)$, and perhaps also $P(0, 7{\cdot}1)$. This point can be seen very clearly in Table VIII (to be discussed below). It is of considerable practical importance, for it suggests, that if we are questioning whether the variance s^2 in a given sample *is too large* for that sample to have been drawn randomly from a population with variance σ^2, *we can obtain comparatively easily from the Incomplete Gamma Function Tables the probability measure required, if only we know the value of* β_2 *in the population we believe to have been sampled.* All that is required is to enter the tables with the p and u given on page 153 in Part I.

(*d*) *The Variance Distribution of the "Normal Theory."*

In a number of cases I have shown in Table VI the appropriate frequencies of the distribution of variance for samples from a normal population—i.e. using the law of equation (21)*bis*. The only cases where reasonable fits have been obtained are for $P(0, 2{\cdot}5)$, $P(0{\cdot}2, 3{\cdot}3)$; $P(0{\cdot}5, 3{\cdot}7)$ and $P(0{\cdot}22, 3{\cdot}16)$, but even here the results are not consistent for all values of n. If we remember that the normal theory value of σ_{s^2} only corresponds to the true σ_{s^2} when $\beta_2 = 3$, this disagreement will not be considered surprising.

6. *The Variation in the Probability Integrals of the Theoretical Curves with B_1 and B_2.*

In the course of the present inquiry a large number of different frequency curves have been obtained by a variety of methods, and it appears worth while examining a little more closely the relation between changes in B_1 and B_2 and changes in the probability integrals. This question is of wider interest than the subject of the present paper; and in order to present the results in more standardised form I have prepared Table VIII. In this are given for the various curves the proportionate tail areas lying beyond ordinates placed at certain deviations from the mean expressed in terms of the S.D. as unit.

In dealing with the five more platykurtic populations three methods of fitting have been employed; the difference formulae were used in all cases to find higher parent population moments:

(*a*) Using the correct first four-moment coefficients, leads to correct B_1 and B_2.

(*b*) Using the correct first three-moment coefficients and correct start, leads to correct B_1 but not correct B_2.

(*c*) Using the correct first two-moment coefficients, correct start and a Type III curve, leads to incorrect B_1 and B_2.

Diagram XII illustrates in the case of three populations the three sets of values of B_1 and B_2 which result. $P(0, 2{\cdot}5)$ is a population for which the three- and four-moment curves are Type I; $P(1{\cdot}0, 3{\cdot}3)$ is one whose (β_1, β_2) point lies close to the $D(s^2)$ III line of Diagram VIII*; while $P(0{\cdot}2, 3{\cdot}3)$ gives three- and four-moment curves in Type VI area. It is interesting to note the change in position of the Type III spots in the Diagram XII relative to the other two as we change from one of these populations to another. These changes in the values of B_1 and B_2 may be associated with the corresponding changes in the form of curve, by a study of Table VIII.

In dealing with the three more leptokurtic populations an additional source of variety has entered because we have obtained curves based

(*a*) on the B_1 and B_2 calculated from the actual higher moments of the parent population;

(*b*) on the B_1 and B_2 calculated from parent population higher moments based on the use of the difference furmulae.

For example, in the case of samples of 10 from $P(0, 4{\cdot}1)$ five different curves have been fitted to $D(s^2)$; these were as follows:

B_1 and B_2 from Table VIII

$P(0, 4{\cdot}1)$, $n=10$	IV (diff. form.)	VI (F) (diff. form.)	VI (N.F) (actual)	VI (F) (actual)	III (F)
B_1	3·880	3·880	2·954	2·954	1·335
B_2	17·324	11·350	8·618	8·879	5·003
P of χ^2 test	—	·493	·438	·402	·006

* Diagram VI is more convenient for general use.

TABLE VIII.

Tail Proportions corresponding to Certain Deviations from the Mean.

P (0, 2·5), $n=5$				P (0, 2·5), $n=10$				P (0, 2·5), $n=20$			
Deviation from Mean	III (F)	I (F)	I (N.F)	Deviation from Mean	III (F)	I (F)	I (N.F)	Deviation from Mean	III (F)	I (F)	I (N.F)
$-1{\cdot}45\,\sigma_s$	·005	·009	·011	$-1{\cdot}75\,\sigma_s$	·007	·012	·013	$-2{\cdot}0\,\sigma_s$	·007	·009	·009
$-1{\cdot}35$ „	·019	·028	·031	$-1{\cdot}50$ „	·030	·038	·039	$-1{\cdot}5$ „	·046	·051	·051
$-1{\cdot}25$ „	·041	·054	·057	$-1{\cdot}00$ „	·148	·157	·156	$-1{\cdot}0$ „	·155	·158	·158
$-1{\cdot}00$ „	·129	·145	·145	$+1{\cdot}00$ „	·154	·158	·158	$-0{\cdot}5$ „	·334	·331	·330
$+1{\cdot}00$ „	·147	·156	·155	$+1{\cdot}50$ „	·081	·081	·081	$+1{\cdot}0$ „	·156	·159	·158
$+1{\cdot}50$ „	·083	·086	·086	$+2{\cdot}00$ „	·041	·038	·039	$+1{\cdot}5$ „	·078	·077	·077
$+2{\cdot}00$ „	·045	·045	·045	$+2{\cdot}50$ „	·019	·016	·017	$+2{\cdot}0$ „	·036	·033	·033
$+2{\cdot}50$ „	·024	·022	·022	$+3{\cdot}00$ „	·009	·006	·007	$+2{\cdot}5$ „	·015	·013	·013
$+3{\cdot}00$ „	·013	·010	·010								
B_1	1·602	1·037	1·037	B_1	0·690	0·423	0·423	B_1	0·321	0·191	0·191
B_2	5·403	4·155	4·204	B_2	4·035	3·429	3·476	B_2	3·482	3·182	3·212

P (0·2, 3·3), $n=5$				P (0·2, 3·3), $n=10$				P (0·2, 3·3), $n=20$			
Deviation from Mean	III (F)	VI (F)	VI (N.F)	Deviation from Mean	III (F)	VI (F)	VI (N.F)	Deviation from Mean	III (F)	VI (F)	VI (N.F)
$-1{\cdot}25\,\sigma_s$	·012	·008	·010	$-1{\cdot}5\,\sigma_s$	·019	·014	·015	$-1{\cdot}75\,\sigma_s$	·014	·010	·011
$-1{\cdot}10$ „	·063	·052	·054	$-1{\cdot}0$ „	·143	·134	·134	$-1{\cdot}50$ „	·039	·033	·034
$-1{\cdot}00$ „	·109	·096	·097	$-0{\cdot}5$ „	·353	·352	·351	$-1{\cdot}00$ „	·152	·147	·147
$-0{\cdot}75$ „	·241	·230	·229	$+1{\cdot}0$ „	·151	·147	·146	$-0{\cdot}50$ „	·339	·341	·340
$+1{\cdot}00$ „	·144	·138	·138	$+1{\cdot}5$ „	·082	·081	·080	$+1{\cdot}00$ „	·155	·151	·151
$+1{\cdot}50$ „	·083	·080	·080	$+2{\cdot}0$ „	·043	·044	·043	$+1{\cdot}50$ „	·079	·079	·079
$+2{\cdot}00$ „	·047	·046	·046	$+2{\cdot}5$ „	·022	·024	·023	$+2{\cdot}00$ „	·038	·039	·039
$+2{\cdot}50$ „	·027	·027	·027	$+3{\cdot}0$ „	·011	·013	·012	$+2{\cdot}50$ „	·017	·018	·019
$+3{\cdot}00$ „	·015	·016	·016					$+3{\cdot}00$ „	·007	·008	·009
$+3{\cdot}50$ „	·008	·009	·010								
B_1	2·230	2·944	2·944	B_1	1·0	1·383	1·383	B_1	0·481	0·678	0·678
B_2	6·345	7·998	8·058	B_2	4·509	5·364	5·420	B_2	3·722	4·162	4·199

P (0·5, 3·7), $n=5$				P (0·5, 3·7), $n=10$				P (0·5, 3·7), $n=20$			
Deviation from Mean	III (F)	VI (F)	VI (N.F)	Deviation from Mean	III (F)	VI (F)	VI (N.F)	Deviation from Mean	III (F)	VI (F)	VI (N.F)
$-1{\cdot}10\,\sigma_s$	·046	·028	·022	$-1{\cdot}50\,\sigma_s$	·013	·006	·006	$-1{\cdot}5\,\sigma_s$	·035	·025	·026
$-1{\cdot}00$ „	·096	·070	·066	$-1{\cdot}25$ „	·059	·042	·042	$-1{\cdot}0$ „	·151	·140	·140
$-0{\cdot}75$ „	·239	·216	·215	$-1{\cdot}00$ „	·139	·120	·120	$-0{\cdot}5$ „	·342	·345	·343
$-0{\cdot}50$ „	·379	·368	·371	$-0{\cdot}75$ „	·243	·231	·231	$+1{\cdot}0$ „	·154	·148	·147
$+1{\cdot}00$ „	·142	·131	·131	$-0{\cdot}50$ „	·356	·355	·355	$+1{\cdot}5$ „	·080	·079	·079
$+1{\cdot}50$ „	·083	·077	·077	$+1{\cdot}00$ „	·150	·141	·141	$+2{\cdot}0$ „	·039	·041	·041
$+2{\cdot}00$ „	·048	·046	·046	$+1{\cdot}50$ „	·082	·079	·079	$+2{\cdot}5$ „	·018	·021	·021
$+2{\cdot}50$ „	·027	·028	·027	$+2{\cdot}00$ „	·043	·044	·044	$+3{\cdot}0$ „	·008	·011	·011
$+3{\cdot}00$ „	·016	·017	·017	$+2{\cdot}50$ „	·022	·024	·024				
$+3{\cdot}50$ „	·009	·011	·010	$+3{\cdot}00$ „	·011	·014	·014				
B_1	2·580	4·297	4·297	B_1	1·179	2·086	2·086	B_1	0·566	1·030	1·030
B_2	6·870	11·045*	10·857	B_2	4·769	6·872	6·878	B_2	3·849	4·886*	4·927

* Calculated from "Sophister's" constants of the VI (F) curves, *Biometrika*, Vol. xx[A]. p. 406.

TABLE VIII (*continued*).

P (1·2, 5·8), $n=5$			P (1·2, 5·8), $n=25$					P (0·22, 3·16), $n=10$			
Deviation from Mean	VI (F) actual	VI (F) diff. form.	Deviation from Mean	VI (F) actual	VI (N.F) actual	VI (F) diff. form.	IV diff. form.	Deviation from Mean	III (F)	VI (F)	VI (N.F)
$-0·9\,\sigma_{s^2}$	·012	·007	$-1·50\,\sigma_{s^2}$	·005	·000	·001	·015	$-1·50\,\sigma_{s^2}$	·021	·018	·017
−0·8 „	·096	·074	−1·25 „	·035	·016	·018	·041	−1·25 „	·067	·063	·063
−0·7 „	·181	·157	−1·00 „	·107	·099	·084	·098	−1·00 „	·144	·139	·139
−0·6 „	·267	·246	−0·75 „	·219	·226	·204	·194	−0·75 „	·242	·240	·240
+0·5 „	·192	·184	+1·00 „	·133	·136	·126	·123	+1·00 „	·151	·149	·149
+1·0 „	·110	·105	+1·50 „	·075	·079	·072	·068	+1·50 „	·082	·081	·081
+1·5 „	·066	·063	+2·00 „	·043	·046	·042	·039	+2·00 „	·042	·043	·043
+2·0 „	·042	·039	+2·50 „	·025	·027	·025	·023	+2·50 „	·021	·022	·022
+2·5 „	·027	·026	+3·00 „	·015	·016	·016	·014	+3·00 „	·010	·011	·011
+3·0 „	·018	·018									
+3·5 „	·012	·012									
B_1	14·743	23·587	B_1	3·049	3·049	5·109	5·109	B_1	0·952	1·131	1·131
B_2	47·615	134·311	B_2	9·579	8·561	15·328	21·974	B_2	4·428	4·831	4·811

P (1·0, 3·8), $n=5$				P (1·0, 3·8), $n=10$				P (1·0, 3·8), $n=20$			
Deviation from Mean	III (F)	VI (F)	I (N.F)	Deviation from Mean	III (F)	VI (F)	I (N.F)	Deviation from Mean	III (F)	VI (F)	I (N.F)
$-1·15\,\sigma_{s^2}$	·033	·018	·000	$-1·50\,\sigma_{s^2}$	·012	·011	·004	$-1·75\,\sigma_{s^2}$	·010	·010	·008
−1·10 „	·041	·038	·003	−1·25 „	·057	·055	·050	−1·50 „	·035	·034	·032
−1·00 „	·096	·093	·070	−1·00 „	·138	·136	·137	−1·00 „	·151	·150	·151
−0·80 „	·208	·205	·206	−0·50 „	·358	·357	·364	−0·50 „	·342	·342	·346
+1·00 „	·142	·140	·142	+1·00 „	·149	·149	·151	+1·00 „	·162	·162	·163
+1·50 „	·083	·082	·084	+1·50 „	·082	·082	·084	+1·50 „	·080	·081	·081
+2·00 „	·049	·048	·050	+2·00 „	·043	·044	·045	+2·00 „	·039	·040	·040
+2·50 „	·028	·028	·029	+2·50 „	·019	·020	·020	+2·50 „	·018	·019	·019
+3·00 „	·016	·016	·017	+3·00 „	·011	·012	·012	+3·00 „	·008	·009	·009
+3·50 „	·009	·010	·010								
B_1	2·667	2·865	2·865	B_1	1·223	1·295	1·295	B_1	0·588	0·615	0·615
B_2	7·001	7·449	7·044	B_2	4·835	4·997	4·778	B_2	3·882	3·942	3·830

P (0, 4·1), $n=5$				P (0, 4·1), $n=10$				
Deviation from Mean	III (F)	VI (F) actual	VI (F) diff. form.	Deviation from Mean	III (F)	VI (F) actual	VI (N.F) actual	VI (F) diff. form.
$-1·1\,\sigma_{s^2}$	·025	·010	·008	$-1·25\,\sigma_{s^2}$	·052	·029	·024	·021
−1·0 „	·080	·047	·039	−1·00 „	[illegible]	·107	·104	·094
−0·9 „	·140	·102	·090	−0·75 „	·2[illegible]	·224	·225	·214
−0·8 „	·203	·165	·153	+1·00 „	·156	·141	·142	·137
−0·7 „	·265	·232	·221	+1·50 „	·083	·076	·078	·075
+1·0 „	·141	·125	·121	+2·00 „	·044	·043	·044	·043
+1·5 „	·083	·074	·071	+2·50 „	·023	·025	·026	·026
+2·0 „	·049	·045	·043	+3·00 „	·012	·014	·015	·016
+2·5 „	·028	·028	·027					
+3·0 „	·017	·018	·018					
B_1	2·893	5·990	7·631	B_1	1·335	2·954	2·954	3·880
B_2	7·340	15·370	20·639	B_2	5·003	8·879	8·618	11·350

P (0, 4·1), $n=20$				
Deviation from Mean	III (F)	VI (F) actual	VI (N.F) actual	VI (F) diff. form.
$-1·50\,\sigma_{s^2}$	·032	·018	·017	·013
−1·25 „	·079	·058	·058	·050
−1·00 „	·149	·131	·131	·123
−0·50 „	·344	·347	·347	·348
+1·00 „	·150	·144	·144	·140
+1·50 „	·080	·079	·079	·077
+2·00 „	·040	·043	·043	·043
+2·50 „	·019	·023	·023	·024
+3·00 „	·009	·012	·012	·013
B_1	0·644	1·470	1·470	1·960
B_2	3·966	5·831	5·806	6·968

P (0, 7·1), $n=10$		
Deviation from Mean	VI (F) actual	III (F)
$-1·10\,\sigma_{s^2}$	·004	·049
−1·05 „	·011	·073
−0·95 „	·040	·126
−0·80 „	·120	·211
−0·70 „	·189	·268
−0·60 „	·263	·324
−0·50 „	·338	·378
+0·50 „	·196	·240
+1·00 „	·110	·142
+1·50 „	·065	·083
+2·00 „	·040	·048
+2·50 „	·026	·027
+3·00 „	·017	·015
+3·50 „	·011	·008

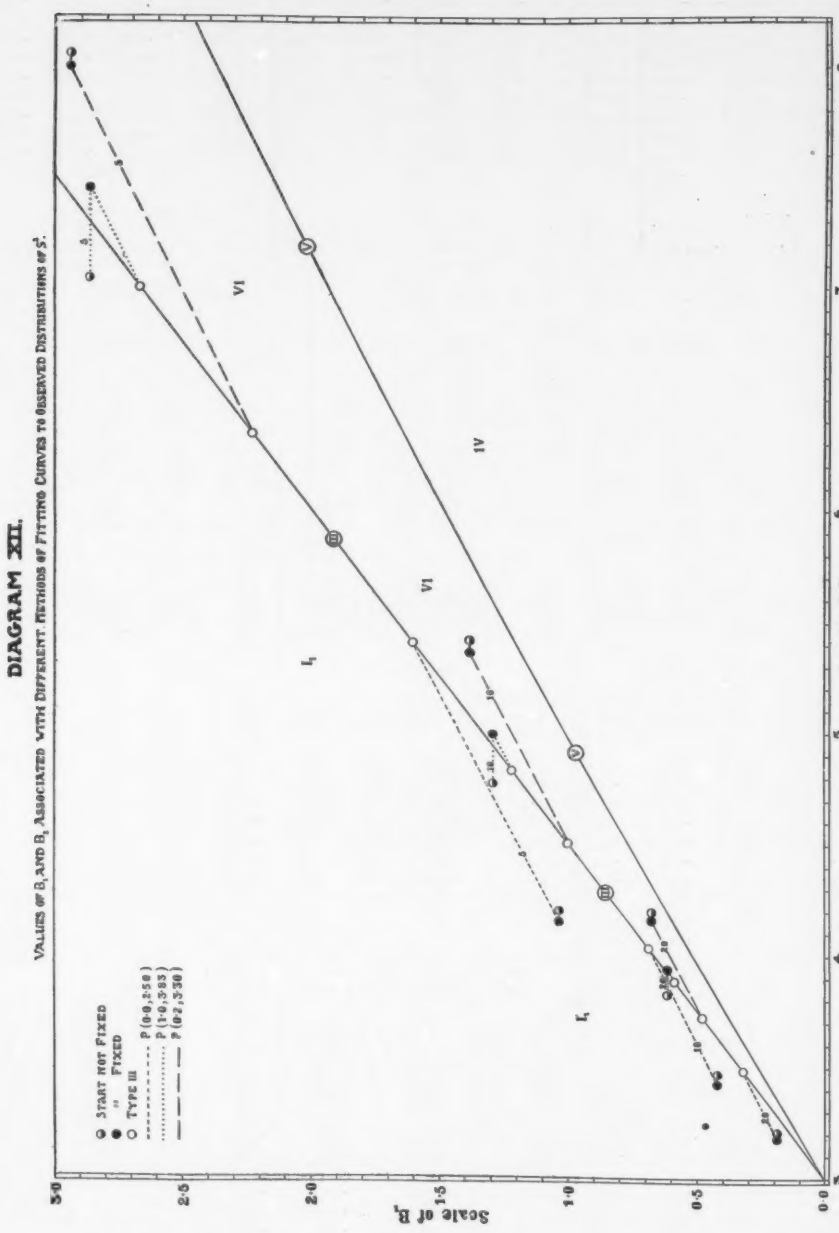
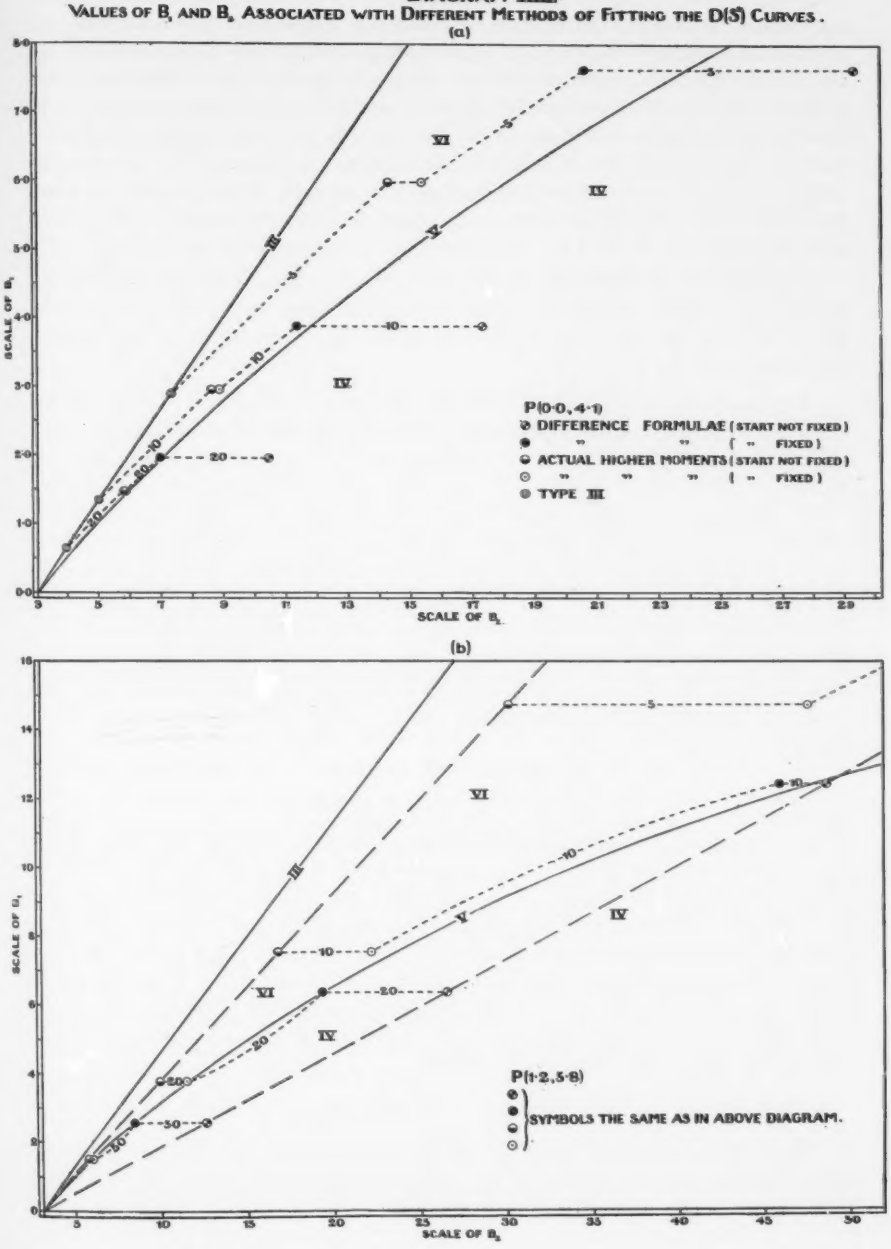


DIAGRAM XII.
VALUES OF β_1 AND β_2 ASSOCIATED WITH DIFFERENT METHODS OF FITTING CURVES TO OBSERVED DISTRIBUTIONS OF s^2.
START NOT FIXED
" FIXED
TYPE III
P (0·0,2·50)
P (1·0,3·83)
P (0·2,3·50)
Scale of β_1
Scale of β_2
I
II
III
IV
V
VI

DIAGRAM XIII.

VALUES OF B_1 AND B_2 ASSOCIATED WITH DIFFERENT METHODS OF FITTING THE D(5) CURVES.



This very great variety in the betas is brought out in Diagram XIII (*a*) which also depicts the results for samples of 5 and 20. The dotted lines connecting up coordinates associated with a given n, are accompanied by small numbers indicating the sample size. The different kinds of spots correspond to the different methods of fitting, and associated with each of these we have, of course, a line similar to those in Diagrams I—III, along which the (B_1, B_2) point converges on (0, 3) as n increases indefinitely. For clearness these lines are not shown, but they can be roughly marked in the diagram by joining the point (0, 3) to spots of one kind. Two such lines are drawn, however, in Diagram XIII (*b*) which represents the case of $P(1{\cdot}2, 5{\cdot}8)$.

A study of Table VIII shows the effect of these changes in B_1 and B_2 on the probability integrals of the curves. It will be seen that the main difference lies almost entirely at the abrupt end of the curve, i.e. in the direction of negative deviations from the mean.

As stated above, this table is of general interest; it is easy to verify that for the normal curve the proportionate tail areas lying beyond deviations from the mean are as follows:

Deviation from mean	$\pm 1{\cdot}0\sigma$	$\pm 1{\cdot}5\sigma$	$\pm 2{\cdot}0\sigma$	$\pm 2{\cdot}5\sigma$	$\pm 3{\cdot}0\sigma$	$\pm 3{\cdot}5\sigma$
Proportionate tail area	·1587	·0668	·0228	·0062	·0013	·0002

and the corresponding values for Type III curves of varying skewness could be obtained from the Tables of the Incomplete Gamma Function. Table VIII will provide a general appreciation of the effect on the probability of other skew Pearson curves of

(*a*) changes in B_1 and B_2;

(*b*) different methods of fitting.

We see, for example, the comparatively small effect on the form of the curve, within the region of significant frequency, of a change from $B_1 = 14{\cdot}743$, $B_2 = 47{\cdot}615$ to $B_1 = 23{\cdot}587$, $B_2 = 134{\cdot}311$ (case of $n = 5$, $P(1{\cdot}2, 5{\cdot}8)$). We also see that in general the fixing of a skew curve at the abrupt start with neglect of the fourth-moment coefficient has very little effect on the other tail of the distribution; and we can form some idea of the nature of approximation that is involved if a Type III curve (based on a knowledge of three constants) is used in place of a Type I or Type VI curve which requires the use of a fourth constant. These and other points for comparison will readily occur to the reader.

7. *Summary and Conclusions.*

The main object of this investigation has been to study the first four moments of $D(s^2)$ with a view to obtaining suitable Pearson curves to represent the sampling distribution in the case of populations which can themselves be represented by

Pearson curves. In Part I the manner in which the variance distribution alters as the population and the sample size alter has been traced out. Firstly, Type I, Type VI and Type IV distributions have been indicated, the latter being mostly associated with very leptokurtic Type IV populations; secondly, a series of $D(s^2)$ III populations has been found whose $D(s^2)$ can be approximately represented for all sample sizes by Type III curves; and, thirdly, it has been possible to give an indication of the limits as to population and sample size, within which $D(s^2)$ may be considered as normal. A general procedure has been outlined for fitting these curves. This is based on the assumption that it will be sufficient to know the first three moments of $D(s^2)$, provided the curves are made to start at $s^2 = 0$. On such an assumption Type IV will not arise. Methods of obtaining the probability integrals of the Type I and Type VI $D(s^2)$ curves with fixed start have been discussed, Type III being treated as a special case. A brief discussion is also given of methods of obtaining the betas of $D(s^2)$ from the parent population constants, special reference being made to difficulties associated with very leptokurtic curves.

The methods outlined in Part I have been tested on twenty-one experimental distributions of s^2, amongst which are included "Sophister's" samples of 5 and 20, and Church's samples of 10 for his population (B). These results seem to lead to the following conclusions: (i) Unless the sampled population is extremely leptokurtic, we are not likely to be misled if, when knowing only β_1 and β_2, we calculate B_1 and B_2 by using the difference formulae. If, however, the population is one whose (β_1, β_2) point represents a very leptokurtic curve such as $P(0, 4{\cdot}1)$ or $P(1{\cdot}2, 5{\cdot}8)$, B_1 and B_2 should preferably be calculated from actual higher betas of that population; (ii) whether actual higher moments or difference formulae betas be used; and whether the population be leptokurtic or not, the fixed start method appears to be on the whole more reliable than the four-moment fit. The former is very satisfactory for all sample sizes, giving in the goodness of fit tests an average P of about 0·49; the latter sometimes leads to quite bad or even impossible fits in the case of very small samples*. The advantages, both theoretical and practical, of the fixed start curves have been indicated; (iii) the Type I and Type VI fixed start equations used to describe $D(s^2)$ appear to be quite adequate for samples of 10 or greater, and low values of P in the χ^2 tests appear to be due mainly to chance fluctuations. The same curves may be used, however, even for samples as small as 5, but here the fits appear to be a little less satisfactory; (iv) we are liable to go far wrong when using the "normal theory" variance distribution to represent $D(s^2)$ in samples from non-normal parent populations; (v) the Type III fixed start curve of equation (21) appears to be applicable in the case of many parent populations in the neighbourhood of the so-called $D(s^2)$ III line. The curve is very satisfactory in the cases of $P(0{\cdot}22, 3{\cdot}16)$ and $P(1{\cdot}0, 3{\cdot}8)$, and even for $P(0, 2{\cdot}5)$ and $P(0{\cdot}2, 3{\cdot}3)$ Table VIII shows that the curve may be used to advantage for certain purposes.

[* Very small samples lead to very abrupt curves, and such curves require the moments corrected for abruptness before fitting. In the absence of the writer in South Africa it is not certain whether such corrections have or have not been made; they might seriously modify the fit whether with curves of free or of fixed start. Ed.]

In conclusion I wish to thank Mr N. K. Adyanthāya and Professor T. Kondo for placing unreservedly at my disposal their experimental distributions in the cases of $P(0, 4{\cdot}1)$ and $P(1{\cdot}0, 3{\cdot}8)$ respectively; and Miss E. Irvine for her careful preparation of the diagrams. Very hearty thanks are also due to Dr E. S. Pearson for suggesting the subject of this investigation and for his invaluable advice and criticism throughout its progress. Last, but not least, I wish to thank my wife, not only for encouragement and moral support, but also for material assistance in the computation of Tables of B_1 and B_2, grouping of observations, etc.

A STUDY OF THE RECENTLY EXCAVATED SPITALFIELDS CRANIA.

By G. M. MORANT, D.Sc., with assistance from M. F. HOADLEY, B.A.*

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(1) *The Discovery of the Material.* In September 1926 human bones were discovered during excavations conducted by the City of London Corporation preparatory to building the westward extension of Spitalfields Market. No reliable account of the circumstances under which the first remains were found can be given, but subsequent disinterments were watched by the late Dr A. L. Thomas, Medical Officer of Health for Stepney, and by Mr A. J. White, Clerk of the Works. The site was visited by the present writer at regular intervals from September 23rd until the area had been completely cleared in October. The position of the retaining wall of the new market is shown on the map (Fig. 1) and no excavations were carried on beyond it. Human remains were only found in the area indicated in the north-west corner of the ground—forming roughly a rectangle of 100 × 150 ft.—and not a single bone is known to have been discovered to the south and east of this area. The top of the bone-bearing stratum was immediately below the rubble on which the demolished houses had been built and 15 ft. below the present road surface. Fragments of brick, clay pipes, oyster shells and other refuse were found intermixed with the uppermost skeletons in some places, but it appeared that the earlier building operations had disturbed comparatively few of them. It is probable that the burial-ground was made up by a number of contiguous pits which were roughly circular in form and with sides sloping inwards. Their diameters appear to have varied from 20—30 ft. and their maximum depths from 2—4 ft. It was not possible to trace the exact course of any one of these communal graves

* Miss Hoadley is entirely responsible for the type contours, and she determined the majority of the measurements and carried out a considerable part of the calculations involved in this paper.

owing to the fact that the ground was not completely cleared to the level of the bottom of the pits. Trenches only were cut through them where the deeper foundations were needed for the modern market. Mr White observed that one pit, or trench, had been dug and filled in again with earth but no bodies: this was adjacent to the east side of the burial-ground. The pits were dug in previously undisturbed sand and filled in with the bodies, sand and brick-earth. A vertical section of one of them is shown in Plate I *a*, and the line marking the bottom of the pit was clearly discernible in this case. The skeletons were in close contact with one another, and there was not the slightest suggestion that they had been definitely orientated or arranged in any orderly way. The majority appear to have been flexed, but some were fully extended and lying face downwards or upwards. A fully extended skeleton is shown in Plate I *b*. At the time the photograph was taken, parts of the clavicle, ribs, pelvis and long bones of the legs could be clearly seen, and on removing more earth the mandible was found in position and the bones of the arm were extended beneath the remains of the body. In every case that was examined carefully all the bones of the skeleton were found together, so they must have been interred as bodies and cannot be supposed to have been brought to the site from a cemetery elsewhere. The disorder in which the remains were found suggests that the bodies had been emptied from carts. A decayed plank of oak was discovered, and a workman declared that he had found it in one of the bone-pits; no confirmation of this statement could be obtained, however. The wood may well have formed part of the tilt-board of a heavy cart. Apart from this, nothing whatever was found in association with the bones. The ground round a considerable number of the skeletons was searched thoroughly, but with a negative result. The absence of buttons, or fastenings of any kind, renders it probable that the bodies were interred either in sheets, or without any form of covering. The way in which the skeletons were lying, and the absence of coffin-handles, plates, nails and wood—apart from the fragment mentioned—show clearly that coffins cannot have been used. A disused brick sewer was found running through the burial-ground along the line of Fort Street. This was at the same level as the bone-pits and they had been cut through to make way for it at several places. The bricks used were said to be of early eighteenth century date. At a time when the present writer was not on the site, several sections were found of an elm water-pipe. The exact position from which they had come had not been recorded, but there is no doubt that it was within the burial-ground and at about the same level as the bone-pits. It cannot have been far below them as the ground was not excavated at any point below the lowest level at which bones were found. Two of these water-pipes are shown end-on in Plate I *c*; the broken end of a third is in the foreground. They were about 5 ft. long, the diameters of the bores being 12 to 18 inches at the larger end and 8 to 12 inches at the other. The metal ring sometimes found round the larger end of such wooden pipes, to prevent splitting when the next section was driven in, was not observed in this case. The wood was not charred and the rough outer surface appeared to be unplaned. A number of objects unearthed during the excavations of the site of the market extension

are preserved at the Guildhall. There is no record of the exact positions in which they were found, and no evidence that any one of them came from the burial-ground area. The collection includes fragments of a Roman urn, a number of broken glass and earthenware vessels, which have been dated between the fourteenth and sixteenth centuries A.D., and an iron ball about $3\frac{1}{2}$ inches in diameter. The last had probably been a cannon-ball originally, but the fact that there is an indentation in the surface suggests that it had either been one ball of a chain-shot, or that it had seen service later as the counterpoise of a steelyard.

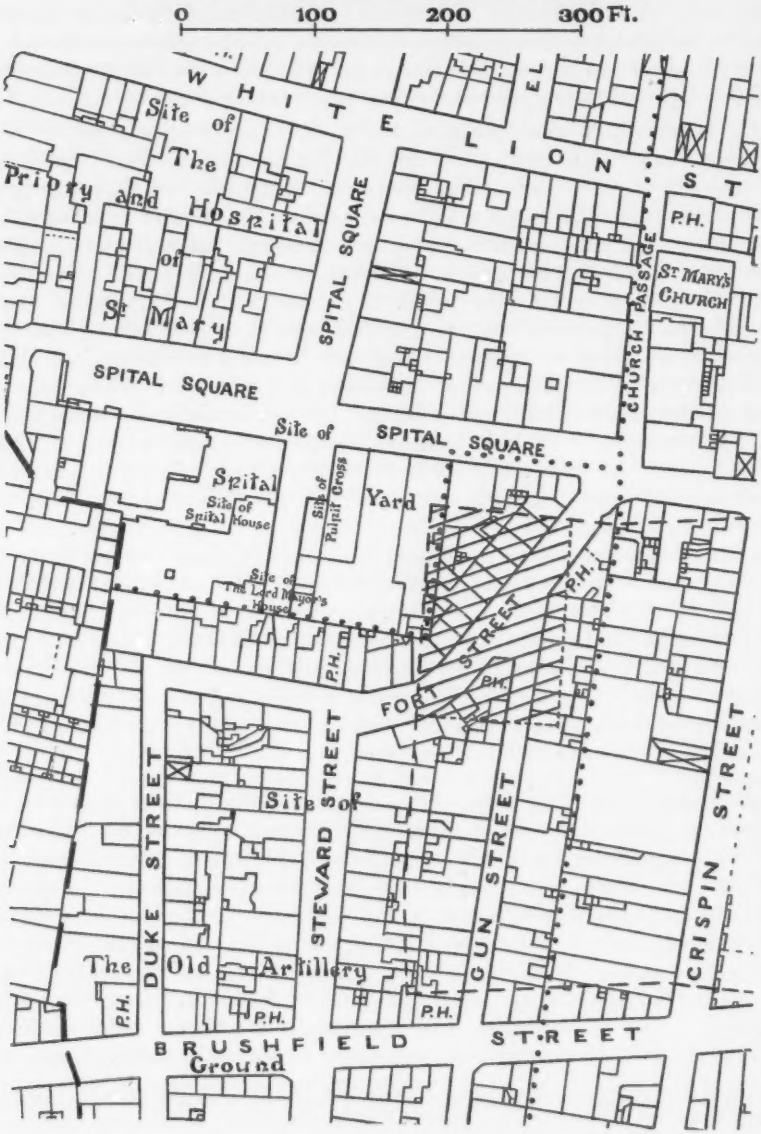
The human skulls from Spitalfields Market are in a good state of preservation, the bone being compact and solid, and showing no signs of abrasion or decay. The majority are of a light or dark brown colour, and only one shows the green discoloration caused by copper which was found on considerable numbers of the crania from the Farringdon Street cemetery. Although well able to withstand a considerable pressure, few complete specimens have been preserved owing to the manner in which they were disinterred. In all, 986 skulls, or fragments of skulls, were numbered separately, but many of them consist only of isolated frontal or occipital bones. Some of these pairs may have belonged to the same individuals, but it is probable that at least 950 individuals are represented. About 500 additional specimens were disinterred which are not now available for study, and at least 1000 skeletons must have been left in the ground which was not disturbed by the building operations. The total number of interments in the area indicated on the ordnance map (Fig. 1) is thus unlikely to have been less than 2500. The limits of the burial-ground had not been reached on two sides, however—to the west and north—and it is probable that it extends for some distance below the present roadways of Steward Street and Spital Square*. A public convenience was built in 1926 at a distance of 80 ft. from the east of the area in which the bones were found and no human remains were discovered there. It is unlikely that fewer than 3000 people were interred in the burial-ground and the number may have been considerably higher. The mode of burial appears to have been the same for all of them. Men, women and children were present in proportions which are considered in a later section of this paper.

(2) *The History of the Site.* Owing to the absence of direct archaeological evidence, an attempt has to be made to determine the age of the Spitalfields interments by considering the history of the site. The cartographic evidence is of particular importance. The position of the burial-ground is shown on the ordnance map (Fig. 1), and it should be remembered that its limits had not been reached on either the north or west sides. The west side of the area excavated is seen to cross a few feet over the parish boundary which formerly divided the liberties of the Old Artillery Ground and Norton Folgate to the north. Horwood's map of 1799 (Fig. 3) shows the district built over and the boundary is rather further to the west, so that it just touches the north-west corner of the excavated area. On

* The present roadways of Steward Street and Spital Square extend up to the retaining wall of the market.

FIG. I. BASED (BY PERMISSION) ON THE ORDNANCE SURVEY MAP, 1894–96 (LONDON, SHEET XII., 56 AND 57.)

– – – – RETAINING WALL OF MARKET EXTENSION. SITE OF BURIAL-GROUND SHOWN SHADED.



Indicating that the site of the excavations was in the north-east corner of the Old Artillery Ground.

Fig. 3. From Horwood's map of 1799. Streets across site and actual houses shown.

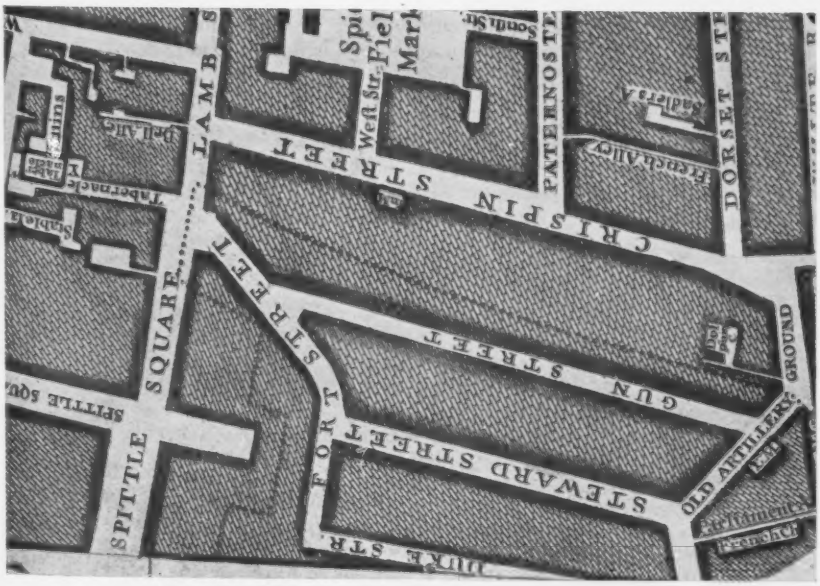


Fig. 2. From Rocque's map: began in 1741, finished in 1745 and published in 1746. Houses not shown, but streets across site.

Rocque's map of 1746 (Fig. 2) the boundary has a different position again, and its corner nearest to Fort Street now falls well within the excavated area, and nearly one-sixth of the burial-ground would appear to have belonged to the liberty of Norton Folgate at that time. Instead of running due west from Fort Street to beyond Duke Street, as in later times, the line, according to Rocque, turns to the south before reaching the southern extension of Spittle Square and then passes midway between that roadway and Fort Street. The area which is here added to Norton Folgate is also shown clearly on Ogilby and Morgan's map of 1677 (Fig. 4), where it is part of what was then the open Spittle Yard. It is clear that the boundary of the Old Artillery Garden at this time was marked by the walls and sides of houses, and not by the chain-line shown which was moved slightly from its true position to suit the convenience of the draughtsman. But, when this allowance is made, the breadth of the northern extension of the Old Artillery Garden is seen to bear a smaller proportion to the total width of the garden, as the same area does on Rocque's map, than is the case with Horwood's, or the ordnance survey. If this were actually the case, then the site of the burial-ground must be supposed to have extended beneath the building which stood in the south-east corner of Spittle Yard in 1677. It is not possible to give any exact proof of this contention since the earlier maps may not have been drawn with precision enough to justify measurements to within a few feet, and the position is unfortunately complicated by the fact that the boundary in question was altered slightly at different dates. For this district, Ogilby and Morgan's map of 1675 is almost identically the same as the one of 1677 here reproduced. All earlier plans of London are known to be far less accurate than theirs. That of Ralph Agas (*ca.* 1560—1570) is shown in Fig. 5, and the northern extension here was clearly given an exaggerated breadth in order that the artist might give a fair representation of the building which bounds it. The Artillery Ground is shown enclosed by a wall on all sides. Braun and Hogenberg's map of 1572 shows the same wall and surrounding buildings, though the one to the north now occupies a central position in the north-east rectangle with which we are principally concerned. The maps of Nordon (1593), Ryther-Grace (1604), Faithorne and Newcourt (1658), Porter (1660) and Moore (1662) all show the Artillery Garden with a straight northern side. It is probable that these were copied from one another in this respect and they are useless for our present purpose.

The bounds of the Old Artillery Garden were given in Letters Patent of James II in 1688 and the following is copied from the transcription given by Bayley*:

"The buttings and boundaries of his Majesty's Tower Ground, called the Old Artillery Ground, are as followeth, viz.

Imprimis. By the wall before the long street, eastwards, towards Spittlefields, and beginning at the south end thereof, called Gun-streete, at the house of William

* *The History and Antiquities of the Tower of London...deduced from Records, State Papers and Manuscripts and from other original and authentic Sources.* London (1825), Vol. II. Appendix, p. cxxi.

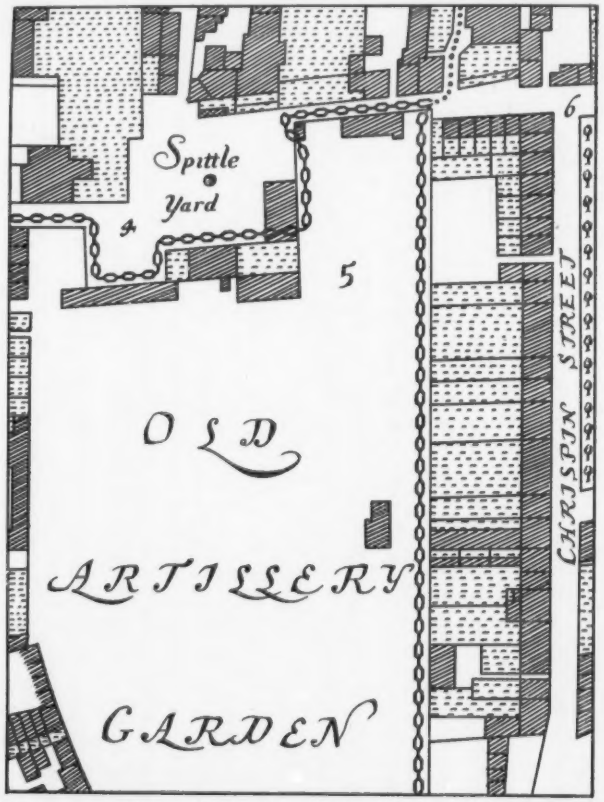


Fig. 4. From Ogilby and Morgan's map, 1677. Showing still the north-east projection of the Old Artillery Ground with a building on part of site of burial-ground.

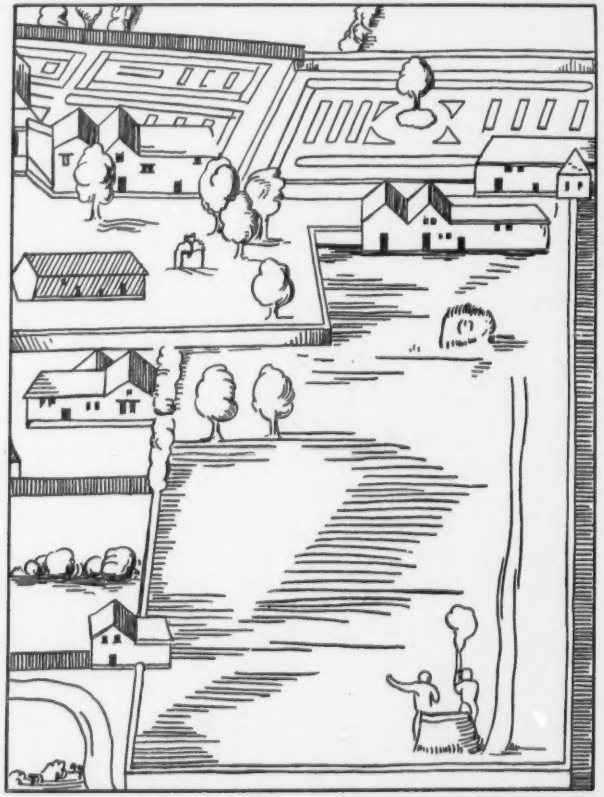


Fig. 5. From Ralph Agas' plan, *ca.* 1560—1570. Showing north-east projection of Old Artillery Ground with a building on part of site of burial-ground.

Boram. And from thence, northward, to the house of Nicholas Squire, is eight hundred twenty-foure foote, little more or less. From thence, westward, to the house of John Bellamy, joyner, one hundred forty-eight foote, or therabouts. From thence southward, to the dead wall, one hundred fourty foure foote, and from the pump within side of the said wall along Forte-street, westwards to the corner of Charles Armstead and John Stranger's houses, two hundred seaventy two foote, little more or lesse. From thence, southward, along Duke-street, to the empty house of Dupres the landlord, three hundred thirty-six foote*...."

The Old Artillery Ground had hence been built over between 1677 and 1688, and Gun Street, Fort Street and Duke Street were in existence before the later date. This is confirmed by other evidence which will be considered later. The breadth of the rectangular extension to the north-east of the Ground is approximately one-third of its total width, if these measurements may be trusted, and this would agree well with Ogilby and Morgan's map, but on Horwood's the same proportion is nearer one-half. The slight alterations which have been made to the position of the boundary seem fairly conclusively to have had the effect of widening the area in question and, if this is so, the burial-ground must have extended beyond the Artillery Ground in the late seventeenth century. It must thus be assigned to a date which was certainly anterior to 1688, almost certainly anterior to 1677, and probably anterior to the time when the Ground was enclosed. A record which enables a close approximation to the earliest of these dates to be given has fortunately been preserved in the Patent Rolls for 1550. It runs:

"Also grant of the parcel of land commonly called the Tesell Grownde in the parish of St Botolph without Busshoppes Gate, London, in tenure of the company or guild of the art of 'Longbowes, Crossebowes and Hangonnes' which belonged to the late hospital of St Mary without Busshopes Gates, and is adjacent to the said hospital and enclosed on its eastern and western sides with stone wall and on the north side not enclosed and is in length on the east side 240 yards (*virgas*) and on the south side 57 yards, on the south west side 120 yards and on the north in width 120 yards and in length 120 yards of assize†."

The ground is shown completely enclosed on Agas' plan, so the wall to the north must have been built shortly after 1550, and it is known to have been "incompassed with a Bricke Wall" as late as the reign of Charles II.

Numerous records relating to the history of the Old Artillery Ground have been preserved. In 1537 Henry VIII incorporated a body, under the title of the Fraternity or Guild of St George, to be overseers of the science of artillery, "to wit for long-bows, cross-bows and 'hand-gonnes.'" This became known later as the Honourable Artillery Company and it appears to have adopted the use of artillery in the modern sense at an early date. In the same year the last Prior of

* "Letters Patent of king James the second setting forth and confirming the liberties and privileges of the Tower." *Rot. Pat.* A°. 3 Jac. II. sexta pars.

† *Calender of the Patent Rolls preserved in the Record Office.* Edward VI. Vol. III. A.D. 1549—1551, pp. 373—374 (1925).

the Convent of St Mary Spittle granted a lease to a similar body styled the "Fraternity of Artillery in Great and Small Ordnance," or the "Gunners of the Tower," of a ground belonging to the Priory for thrice ninety-nine years for the practice of great and small artillery*. No trace is now known to exist of the charter of this body, or of the lease, although the former was delivered to Lord Burleigh, Lord Treasurer to Queen Elizabeth, and it was frequently referred to. The field in question was then known as the Teazel Ground from the fact, it is supposed, that the plant of that name used in carding wool was cultivated there. Afterwards it was called the Artillery Yard or Garden. The right to use the site was a constant source of dispute between the Master Gunner of the Tower and the Company. This probably induced the latter to seek for a new headquarters and in 1641 they acquired their Artillery Garden in Bunhill Fields. They continued to practice at Spitalfields until 1658, however, when the armoury was removed. What was hereafter called the Old Artillery Ground now belonged without question to the Tower, and it remained in that ownership until 1683 when the whole, "conteyning by admeasurement ffive acres and one roode bee the same more or lesse as the same is now incompassed with a Bricke Wall," was sold by the Crown for £5700. The deed, quoted in part above (p. 196), shows that the area was built over by 1688. Several incidental references to the site occur among the records of the sixteenth and seventeenth centuries, petitions and grants being particularly numerous owing to the fact that several different bodies obtained permission to use the ground at one time or another. Towards the end of the sixteenth century its use as an artillery or archery ground seems to have declined, and an Order in Council was issued directing steps to be taken to revive the exercises of the Company. Writing at that time Stow says it was "letten to the Crosse-bow-makers, wherein they used to shoote for games at the Popingey," and he speaks of the field being "inclosed with a bricke wall" and says that the Gunners of the Tower practised there every Thursday. There was a revival of such practices early in the following century, and in 1622 the Company complained to the Privy Council that the Master Gunner to His Majesty had enclosed certain of their cabbage gardens and restrained them from using a butt. At the same time they begged for permission to build an armoury, and this building, finished in the following year, is shown on contemporary maps along the southern boundary of the field. A pamphlet in the British Museum, entitled "A Faire in Spittlefields," gives an account of a day's proceedings there about the year 1658, the year in which the Honourable Artillery Company severed its connection with the site. At that time the Old

* Particulars of the history of the Old Artillery Ground have been taken from original records and from the following sources in some of which a few records are printed:

G. A. Raikes: *The History of the Honourable Artillery Company.* 2 vols. (1878).

W. H. Manchée: "Memories of Spitalfields," *Proceedings of the Huguenot Society of London*, Vol. x (1914); "Spitalfields," *Transactions of the London and Middlesex Archaeological Society*, New Series, Vol. II (1913), pp. 454—478.

J. H. Scott: *Spitalfields, Past and Present.* Second enlarged edition (N.D.).

H. A. Harben: *A Dictionary of London* (1918).

John Stow: *A Survey of London*, Kingsford's edition (1908); *A Survey of London and Westminster*, Strype's edition (1720).

Artillery Ground appears to have been a waste piece of ground on which fairs and other meetings were held. Pepys visited it to observe the trials of a new gun on April 20th, 1669, and it appears to have been used by the Gunners of the Tower for their practices, and by other people as a garden, until sold in 1683. There is not the slightest suggestion that any part of the area enclosed by a wall was used as a burial-ground at any time between 1537 and that later date, and the absence of evidence would seem to render it extremely improbable that the bodies were buried in that period. If the burial-ground extended under the wall, as we conjecture from the maps, then that possibility is still more remote. At the same time it may be suggested that such an open piece of ground, close to a thickly populated region, is extremely likely to have had plague-pits dug in it, in a time of emergency. That it should have been used for periodic burials, and hence for a long period, in normal times is hardly conceivable, especially as no coffins were used.

The last outbreak of sweating sickness in England was in 1551 and the total deaths in London were probably less than one thousand*. Plague was epidemic all over the country in the first half of the century, but there appears to have been no catastrophic outbreak in the Metropolis before that of 1563. In that year there were 17,000 plague deaths for the City and liberties, but the east is not known to have been more affected than other parts. No other epidemic nearly so severe as this appears to have visited London until 1592—3 when the deaths from the plague in and about London were 15,000. In 1603 there were more than 30,000 deaths from the same cause, but only 1871 of these individuals are reported in the bill of mortality to have been buried in the parish of Stepney. The earliest references to pest-houses and plague-pits relate to this time. In 1625 there was a more violent outbreak and the epidemic certainly accounted for more than 40,000 deaths in and about London. The large parish of Stepney, extending from Shoreditch to Blackwall, was one of the worst districts, but the total for Stepney, Newington, Lambeth, Islington, Hackney and the Westminster parishes did not exceed 6000. A minor visitation in 1636 accounted for 10,400 deaths, and after that London was comparatively free from the scourge until the great plague of 1665, during which the total mortality cannot have been far short of 100,000.

Although they were catastrophic enough, it would seem that no one of the great epidemics of the sixteenth and seventeenth centuries was on a large enough scale to account for 3000 burials in one ground, except those of 1625 and 1665. There is no evidence that plague-pits were dug in the Artillery Ground at either of these dates, and the fact that the area was enclosed and used for a specific purpose may be taken, perhaps, to tell against the probability of it having been used then for a burial-ground. There was waste ground immediately to the north and east. It is known that the Artillery Company protested successfully against the suggestion that any part of their new Artillery Ground at Moorfields should be used for plague-pits in 1665, and there is no reason to believe that the Gunners of

* Charles Creighton: *A History of Epidemics in England*, Vol. 1 (1891).

the Tower were likely to have been more yielding when suitable sites could be found without difficulty in the immediate neighbourhood of their possessions. Few records of topographical importance relating to the plague of 1625 have been preserved, but several dealing with the greater calamity forty years later have an immediate bearing on the present problem. Although published 55 years after the event De Foe's narrative is known to be veracious on the whole. Commenting on the marked increase in the population of London before that year he writes: "that there were no less than a hundred-thousand riband-weavers in and about the City; the chiefest number of whom lived then in the parishes of Shoreditch, Stepney, Whitechapel, and Bishopsgate; namely, about Spittlefields; that is to say, as Spittlefields was then, for it was not so large as now by one fifth part*." Brayley remarks that the number referred to must be a gross exaggeration as the population in this district was only 97,284 in 1800. The parish of Stepney was the last infected, but in the end it headed the list with 8598 deaths, whereof the plague 6583†. De Foe gives the following account of its burial-grounds:

"Stepney parish, extending itself from the east part of London to the north, even to the very edge of Shoreditch church-yard, had a piece of ground taken in to bury their dead, close to the said church-yard; and which for that very reason was left open, and is since, I suppose, taken into the same church-yard; and they had also two other burying-places in Spittlefields; one, where since a chapel or tabernacle has been built for ease to this great parish, and another in Petticoat Lane.

"There were no less than five other grounds made use of for the parish of Stepney at that time; one, where now stands the parish church of St Paul's, Shadwell; and another, where now stands the parish church of St John, at Wapping; both which had not the names of parishes at that time, but were belonging to Stepney Parish‡."

The plague-pit, "where since a chapel or tabernacle has been built," has been identified with a site of which W. H. Manchée has provided a short history (*loc. cit.* 1913). This is immediately to the north of the Artillery Ground. Sir William Wheler obtained an Act of Parliament permitting him to build on his property there in 1660. In 1692 the "Tabernacle" (see Figs. 1, 2 and 3) was opened and a burial-ground of 6000 square feet was attached. The north of the Artillery Ground had been built over a few years earlier. It is suggested that the plague-pit referred to by De Foe was in the garden to the west of Tabernacle Yard and not on the site of the chapel. In either case it may have been less than 200 ft. from the area with which we are particularly concerned, but still separated from it in 1665 by the wall of the Artillery Ground and at least one building. It is probable that there were many more plague-pits in use at that time than the ones mentioned by De Foe, and there is still the possibility that there was another one within the Ground. There are said to have been five pest-houses about London

* Daniel de Foe: *A Journal of the Plague Year; or, Memorials of the Great Pestilence in London, in 1665.* E. W. Brayley's edition (1848), p. 29.

† Creighton, *op. cit.* p. 511.

‡ *Op. cit.* pp. 317—318.

of which record survives, although De Foe says there were only two, and one of these served the Tower Hamlets and cases taken from the Tower*. Its position and that of its burial-ground are unfortunately not known.

Having failed to find the slightest evidence that the Spitalfields burial-ground was used as such during the period when it formed part of the Old Artillery Ground, it becomes necessary to consider the history of the site in earlier times. The Hospital of St Mary without Bishopsgate was founded in 1197†. The priory consisted of Austin canons, whose duties were religious, and lay brothers and sisters entrusted with the care of the sick poor. For some unknown reason the house was refounded in 1235, and the church was moved further to the east. In 1279 a new source of water supply was obtained. This was granted by John, Bishop of London, and the confirmation of the grant has been preserved‡. Licence was given to enclose a spring called "Snekockeswelle" in his field called "Lollesworthe" and to lead the water underground along the bed of the old ditch which ran westward almost to the south corner of the hospital, and thence to lead it firstly to the infirmary and then to the other offices. The field called Lollesworthe lay immediately to the east of the priory land which became later the Old Artillery Ground, and it is extremely probable that the elm water-pipes found during the recent excavations (see Plate I *c*) were the ones laid down in 1279. Unfortunately there is no archaeological evidence which could decide whether the pipes antedate the burials or not. The size of the institution in 1303 can be judged by the fact that the annual revenue of 300 marks was deemed sufficient to maintain the accustomed number of inmates, viz. twelve canons, five lay brothers and seven sisters. The priory lands extended from Berwards Lane (? Artillery Lane) on the south to the parish of St Leonard Shoreditch on the north, and from King's Street (? Bishopsgate Street) on the west to the Bishop of London's field called Lollesworthe on the east. This area was in the parish of St Botolph without Bishopsgate, and Prior Godfrey (*ca.* 1218) covenanted for himself and his subordinates and their successors that they would not admit: "any of the parishioners of the said church living or dead to any offering or ecclesiastical office, or to any prejudicial act to the said church or parson of the same. Nor to admit them to sepulture, unless a competent satisfaction for it was first made to the said church§." At the dissolution the King's Visitors found 180 beds for the reception of sick persons and travellers, and the net revenue just exceeded £500. In 1537—the year in which the Artillery Ground was ceded—Sir Richard Gresham, then Lord Mayor, petitioned that the priory might be handed over to the City, but with no avail. A grant was made to Richard Moryson in 1540 of: "the messuage, mansion, or building called 'le Fermerye'...the buildings called 'le Dorter' (90 feet long), and the hospice and building called the

* W. G. Bell: *The Great Plague in London in 1665* (1924), pp. 39, 165—166.

† In addition to those given in well-known sources—Leland, Dugdale, Tanner, Newcourt, Stow, Harben, and the *Victoria History*—the account of the Priory given by Henry Ellis (*The History and Antiquities of the Parish of Saint Leonard Shoreditch and Liberty of Norton Folgate* (1798)) is of value. The deed of foundation is given by Dugdale and Ellis.

‡ *Ninth Report of the Royal Commission on Historical Manuscripts*, Part I (1883). Appendix, p. 29.

§ Newcourt: *Repertorium*, Vol. I. p. 467.

'toure' thereto adjoining; and the parcel of waste ground leading from the churchyard of the said late hospital to the 'Farmery,' the gardens called 'le Pryours gardeyn' and 'le Covent garden' within the enclosure of the said hospital; and the stable in the Pryour's garden, and the waste ground adjoining the same garden; and also tenements and lands belonging to the Priory in the Parish of Shoreditch; and the said gardens contain in breadth at the south end, from east to west, viz. from the 'Busshopps Fyldes' to the said Farmery 174 ft.*" The Bishop's fields are Lollesworthe and the garden and buildings can be seen on Agas' plan (Fig. 5). In 1541 a lease for 21 years was granted to one Nicholas Bristowe of the "Priory or New Hospital of St Mary without Bishopsgate, London; except the buildings in which the infirm there lie for the term of their lives†." The reversion of the site was granted to Stephen Vaughan and it continued in that family for some years and was afterwards divided. It is not known when the priory buildings were destroyed. In Van den Wyngaerde's view (1550) the church is shown, evidently on a scale larger than that of the surrounding buildings, and the position of the Artillery Ground is not indicated. Remains of the priory were said to have been discovered in 1723‡, 1725§, 1892‖, and they have doubtless been found at other times as well. Stow's account is again of particular importance; he writes:

"In place of this Hospitall and neare adjoyning, are now many faire houses builded, for receipt and lodging of worshipfull persons. A part of the large Church yeard pertaining to this Hospitall, and severed from the rest with a Bricke wall, yet remaineth as of olde time, with a Pulpit Crosse therein somewhat like to that in Paules Church yard. And against the said Pulpit on the Southside, before the chernell and Chappell of Saint Edmund the Bishop, and Marie Magdalen, which chappell was founded about the year 1391...remaineth also one faire builded house...."

This "house" was built to accommodate the Mayor and Corporation "and other honourable persons" while they listened to the sermons preached in the Easter holidays, and it was first put up in 1488.

"In the year 1594 this Pulpit being old, was taken down, and a new set up, the Preachers face turned towards the south, which was before towards the west, also a large house on the east side of the said Pulpit, was then builded for the governors and children of Christs Hospital to sit in...but within the first yeare, the same house decaying, and like to have fallen, was againe with great cost repayred at the Cities charge. On the East side of the Churchyard lieth a large field of olde time called Lolesworth¶...."

* *Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII*, Vol. xv. p. 294.

† *Ibid.* Vol. xvi. p. 724.

‡ William Camden: *Britannia*, Gough's edition (1799), p. 22.

§ William Dugdale: *Monasticon Anglicanum*, Caley, Ellis and Bandinell's edition, Vol. vi (1846), p. 623.

‖ Scott, *op. cit.* p. 8.

¶ *Op. cit.* Kingsford's edition, pp. 167—168.

Spital Square was called Spittle Yard until 1722 and No. 32 is the alleged site of the Pulpit Cross*. The area with which we are primarily concerned is less than a hundred feet from this spot, and it seems to be extremely probable that the whole of our burial-ground was within the churchyard of the hospital. If that were so, it may seem unnecessary to seek further for an explanation of the presence of the remains discovered there in 1926. Before discussing this question we may note, *en passant*, that the "house" built to the east of the pulpit in 1594 must have adjoined, or possibly covered, part of the site in question, if the suggestion derived from a comparison of the maps be correct and it extended beyond the wall which surrounded the Artillery Ground at that time. The Spital Cross was broken down by Puritans in 1642 and the sermons there were discontinued.

It will be pertinent to our enquiry to summarise what little is known of the history of this district anterior to the time when St Mary Spital was built. Stow is again the principal authority; he writes:

"On the East side of the Churchyard lieth a large field, of olde time called Lolesworth, now Spittle field, which about the year 1576 was broken up for Clay to make Bricke in the digging whereof many earthen pots called Urnæ were found full of Ashes, and burnt bones of men, to wit, of the Romanes that inhabited here." Roman coins were found associated with these urns. "There hath also beene found in the same field diverse coffins of stone containing the bodies of men: these I suppose to bee the burials of some especiall persons, in time of the Brytons, or Saxons, after that the Romanes had left to governe here. Moreover there were also found the sculs and bones of men without coffins, or rather whose coffins (being of great timber) were consumed. Diverse great nailes of Iron were there found, such as are used in the wheeles of shod Cartes, being each of them as bigge as a mans finger, and a quarter of a yard long†."

The nails were presumed to be those of the decayed coffins. In his addition to Stow, Strype mentions that these graves were also opened at a later date, not specified, and one skull is said to have been unusually large‡. Writing in 1896 Mrs Basil Holmes refers to Stow's account—though the date is given as 1756 and the place is mis-spelt Lottesworth—and adds that: "on many occasions during the last century, urns, lachrymatories, monumental stones, etc., were discovered in different spots in the district above mentioned§." I have not been able to discover where any accounts of these finds are given. A letter by Bagford in Hearne's edition of Leland's *Collectanea*‖ refers to Roman remains in the district. The writer says:

* Manchée, *loc. cit.* (1914), p. 11. Cf. Horwood's map (Fig. 3), on which No. 32 is marked, and the ordnance map (Fig. 1).

† *Op. cit.* Kingsford's edition, pp. 168—170.

‡ *Op. cit.* (1720), Vol. I. Book II. p. 99.

§ *The London Burial Grounds*, p. 26.

‖ *Joannis Lelandi antiquarii de rebus Brittannicis collectanea* (1770). Bagford's letter is given in Vol. I. pp. lviii—lxiv; it is entitled, "A Letter to the Publisher, written by the ingenious Mr John Bagford, in which are many curious remarks relating to the City of London, and some things about Leland."

"I shall next turn towards Spittle-Fields, where the like (i.e. Roman) antiquities have been found many years ago, and were seen by John Stow, and are mentioned by Weever and others. These fields lie...in that part which formerly bore the name of the Old Artillery Ground, and was their Field of Mars, in which place the Romans trained up and exercised their young soldiers, and likewise the youth of the neighbouring Britains, in the skill and exercise of arms....This field of Mars...must needs have been a very large place, as the same is excellently described, and likewise observed to have been a Roman camp by a judicious author in the latter end of Queen Elizabeth's reign, published in a small quarto pamphlet, but I have forgot the author's name."

Weever and the others and the "judicious author" do not appear to have been referred to by any later writers on the history of Spitalfields. Writing at the end of the eighteenth century, Ellis* was unable to identify them, although he was well acquainted with the district and its history, and no mention is made of other discoveries in that century. He remarks that Roman cemeteries were outside their cities and usually near highways and is led to conjecture that a Roman road ran along the line of Artillery Lane. It is now known that a Roman road issued from Bishopsgate and a large cemetery, or cemeteries, are thought to have flanked it for considerable distances on both sides. The recent inventory of Roman remains in London† only refers to Stow's account of discoveries in Spitalfields. The Roman urn brought to light in 1926 (see p. 193 above) was found somewhere within the area excavated in that year and this covered part of the Old Artillery Ground and part of Lolesworth. It appears to be extremely probable, however, that the ground from which the skulls were taken once formed part of a large Roman cemetery.

It is, unfortunately, not possible to determine the age of the burials at Spitalfields with any close approach to certainty from a consideration of the known history of the site. Under these circumstances another kind of evidence may weigh decisively in the balance of probabilities: this is the anthropological nature of the series of skulls and the conclusions derived from their characters as to the racial origin of the population represented. These questions are dealt with in detail in following sections of this paper and some of the results arrived at may be anticipated here. The cranial series from Spitalfields Market is racially as homogeneous as most single European ones that have been described and it shows rather less variability than those from the seventeenth-century burial-ground in Farringdon Street and the clearance or plague-pit in Whitechapel. Sexing by appreciation, two-thirds of the specimens were classed as male and one-third as female, and the discrepancy between the sexes is probably due, in part, to the fact that there was a stringent post-mortem selection which would favour the preservation of the stronger male skulls. The males, females and children all belong to the same racial type. Our knowledge of the craniology of seventeenth-century Londoners is derived from the studies of the Whitechapel,

* *Op. cit.* pp. 105—107.

† *Royal Commission on Historical Monuments (England). An Inventory of the Historical Monuments in London.* Vol. III. *Roman London* (1928), see pp. 159—160, etc.

Moorfields and Farringdon Street series. These are of closely similar though not identical types, and there is every reason to believe that the population they represent was directly descended in the main from that of the Iron Age English and Romano-Britons, and that the type has persisted with little modification until to-day. The Spitalfields type is so far removed from this one that it must be assigned to an entirely different race; it is equally removed from the known Neolithic, Bronze Age and Anglo-Saxon races of England. This suggests forcibly that we are dealing with a group of people which was foreign to London, if not to England as a whole, and one, too, which had not intermixed at all—or, at most, only to a very slight extent—with the natives of that city. Some 3000 bodies, or possibly considerably more, were buried on this site, and if they all died within a year, as is extremely probable, then it is reasonable to suppose that the contemporaneous population from which they were drawn numbered at least 6000. At what time in English history anterior to 1685, say, can as many foreigners have been resident in London? In 1682 Charles II granted a charter for Spitalfields Market which was built immediately to the east of the Artillery Ground, in the following year the Ground was sold and by 1688 it was completely built over. The Spitalfields district is peculiarly associated with French weavers, but they are not known to have settled there in large numbers until after the revocation of the Edict of Nantes in 1685*.

There were several returns of the number of foreigners residing in London in the sixteenth and seventeenth centuries†. The totals cannot, of course, be supposed to be exact, and "naturalised" foreigners were generally not counted. In 1540 the number of "strangers," excluding women and children, was found to be 2500, and by 1549 the number had decreased to 2200. A return for 1567 gives the total number of strangers in the City of London, and not including Westminster, as 2730; 2030 of these being Dutch and 428 French. The alien population seems to have increased considerably in the next few years and the newcomers settled in Westminster and the Liberties rather than in the City proper. In 1571 the total foreigners in the City, including men, women and children, was 4269, and three-quarters of these were Dutch. There were found to be only 18 French people living in Bishopsgate Ward at this time. In a return made in 1618 the total number of strangers within the City proper is given as 837 and the totals (men and women) for the parish of St Botolph's are 17 in 1598, 16 in 1600, 166 in 1611, 191 in 1621 and 110 in 1625‡. For Bishopsgate Ward the total number of men foreigners in

* It has been estimated that about 80,000 French refugees settled in England during the ten years which preceded or followed 1685 and at least one-third of these are thought to have settled in London (Weiss). They augmented the earlier colonies of foreigners in Long Acre, Seven Dials, Soho, Wandsworth and, especially, Spitalfields. Between 1687 and 1742 they opened 11 new churches in the last-named district where previously not a single foreign one seems to have existed (Smiles).

† Many of these are given, together with estimates derived from other sources, in "Returns of Aliens dwelling in the City and Suburbs of London from the reign of Henry VIII to that of James I." *The Publications of the Huguenot Society of London*, Vol. x. Parts i, ii and iii (1900—1917). Edited by R. E. G. Kirk and E. F. Kirk.

‡ The return for 1618 is given in *Lists of the Foreign Protestants and Aliens resident in England, 1618—1688, from returns in the State Paper Office.* Edited by W. Durrant Cooper (Camden Society, 1862).

1618 is given as 196*. Judging from this evidence, the foreign population of London can never have been nearly large enough to account for 3000 burials representing a single race at any time in the sixteenth century, or in the first quarter of the seventeenth. It has frequently been stated that there was a marked increase in the number of refugees who sought shelter in London in the later decades of that century, but few statistics of any value seem to be available for the period between 1625 and 1685. The alien population cannot have been greatly augmented in the immediate neighbourhood of the Old Artillery Ground before the new building in that district which began about 1660 and became extensive about 1680†. Manchée offers several explanations of why the Spitalfields area should have become the home of the French silk-weavers who arrived in 1685. The places where the earlier refugees of that nationality had settled became known by the name of "Petty France," and one of these, on which tenements were erected in the reign of Elizabeth, was situated near St Botolph's Church, Bishopsgate. The presence of their compatriots there is thought to have attracted the silk-weavers to the adjoining district a century later. There is also evidence that Nonconformists had congregated in this quarter and that there was a large weaving colony—of English artisans, presumably—in the locality. The returns of foreigners show conclusively that the French inhabitants of "Petty France" without Bishopsgate cannot have numbered more than a few hundreds, counting those who were born in England, at any time before 1625. Their numbers may have increased considerably by 1665, but it is improbable that there can have been 3000 deaths among them in that year.

The records for the centuries during which our site lay within the grounds, and almost certainly within the graveyard, of St Mary's Spittle, are very imperfect. There are known to have been many severe famine-pestilences and plagues. The deaths in London during the Black Death are estimated to have been between 20,000 and 30,000, and the sites of three additional burying-places which were used in 1349 are known‡. An outbreak of plague somewhere between 1405 and 1407 is also said to have led to 30,000 deaths in London§, though this is probably an exaggerated number, and the mortality from the same cause must have amounted to thousands at least during several other periods. The ratio of deaths to the total

* The numbers of foreigners in London according to these returns seem to be surprisingly small, and their restriction is probably due to the fact that there was no accommodation for them there at times when building in and round the Metropolis was discouraged as far as possible by statute. Burn (*The History of the French, Walloon, Dutch and other Foreign Protestant Refugees settled in England, from the reign of Henry VIII to the Revocation of the Edict of Nantes*, 1846) estimates that more than 100,000 men fled from the Netherlands in 1567 to escape from the Duke d'Alva's tyranny, and large numbers of these Walloons are said to have settled in Canterbury, Norwich and other towns, but London is not mentioned. Thousands of Huguenots must also have reached this country between the Massacre of St Bartholomew (1572) and the Edict of Nantes (1598), but there is no evidence that they increased the foreign population of London to any great extent.

† Manchée, *loc. cit.* (1914), p. 5: "Sir William Wheler, a resident in Spital Square, obtained an Act of Parliament permitting him to build on his property lying to the east of the square. This most probably marks the beginning of the quarter destined to become so famous later as the home of the French silk weavers...."

‡ Creighton, *op. cit.* pp. 126—129. § *Ibid.* p. 220.

population of the town was almost certainly higher during these pestilences than at any later time. The population of London in the twelfth and thirteenth centuries was probably of the order of 40,000 and a more reliable estimate for 1377, derived from the numbers assessed for the poll-tax, is 44,770. There was a decline at this time following the Black Death. By 1583 the total, estimated from the births, had risen to 120,000, but that is 50 years after the end of the period to which we are now referring*. The number of foreigners resident in London during the time when the Spittle was used has been said to be large, but there appear to be no statistics of any value available†. It is hardly conceivable that there can have been enough of one single race to account for a minimum of 3000 burials during a single plague, and that they should have been entirely segregated in consecrated ground. In describing the method of disposal of the dead Creighton remarks that: "The churches or churchyards of monasteries were in great request for burial, but not for common burials, or for burials in a time of epidemic‡."

The case of a mediaeval hospital is perhaps different, but there is known to have been an unlimited extent of ground, which does not seem to have been used for any useful purpose, immediately to the east of the precincts of St Mary's. The possibility of the burials being those of the patients who died in the hospital in a considerable period of time, and not necessarily in a time of plague, may be suggested; the absence of coffins would not be surprising in such a case as they were seldom, if ever, used by the common people. But the foreign and homogeneous nature of the population seems to be an insuperable objection to such a theory, and it is also rendered unlikely by the fact that the bodies were interred without the slightest attempt at orientation. There is no reason to doubt that the population of London in the seventeenth century was directly descended in the main from that of the mediaeval town, and the Spitalfields type must hence be supposed foreign to that of London, but it may still be suggested that it represents an English rural population. The bodies may be those not of plague victims, but of people massacred. During the insurrections of Wat Tyler (1381) and Jack Cade (1450) considerable numbers of Kentish insurgents are known to have been killed in London and it is likely enough that they were buried on each occasion in one place and with scant ceremony. But it is hardly likely that part of a priory churchyard should have been used for such a purpose, and it is extremely improbable that there were nearly as many women as men and a considerable number of children among the slain. While no dogmatic statements can be justified, the balance of the evidence suggests clearly that the burials are almost as unlikely to belong to the period when the site formed part of the burial-ground of the hospital as they are to belong to the time of the Old Artillery Ground.

The type of the Spitalfields skulls is as far removed from the types both of Romano-Britons and Anglo-Saxons as it is from that of the seventeenth-century

* Creighton, *op. cit.* pp. 34, 44, 200, 201 and 345.

† The approximate estimates of contemporary and most later writers almost certainly exaggerate the numbers, as they do almost invariably for the sixteenth and seventeenth centuries for which there are some fairly reliable determinations.

‡ *Op. cit.* p. 332.

Londoners. The population of Saxon London may never have exceeded 20,000 at any one time. Although stormed more than once by Vikings, the invaders are presumed to have conformed to a very similar physical type to that of the townsmen, and no other foreigners are known to have had any warlike or other effect on them.

The question whether the age of the burials may reasonably be referred to Roman times has next to be considered*. Dio Cassius gives an account of severe fighting in 43 A.D. between the Britons and Romans at a point on the Thames which is presumed to have been London, and a bridge across the river is mentioned. Both sides are said to have lost many *men*. The well-known account of Tacitus† refers to the year 60, and he says that the town was then a busy and populous trading centre. After sacking Colchester, Boudicca marched on London and all who had not been able to flee with Suetonius were massacred. It is stated that no prisoners were made and that none was spared on account of age or sex. The number killed in these two towns, and in St Albans, is given as 70,000. It is not known when London was re-occupied, but the town wall is believed to have been erected within half a century of the Boudiccan revolt. The fact that the insurrection was suppressed very shortly afterwards suggests that there was a speedy return. Londinium does not appear again in written history until the year 296. Allectus had established himself in Britain after murdering his predecessor, Carausius, and Constantius Chlorus set out to recover the colony. Two fleets sailed from Boulogne and the forces from one of these landed, probably in Hampshire, and defeated Allectus who was slain. The fugitive mercenaries of the usurper reached London and began to pillage there. The other fleet had in the meantime sailed up the Thames and it arrived in time to bring succour to the provincials, and the pillagers were slaughtered. There are not known to have been any other massacres in London during the Roman occupation. It would obviously be rash to associate the burial ground in Spitalfields with either of these while there is a complete absence of direct evidence which might support such a contention, but a consideration of indirect evidence which may affect the probabilities of the case will not be irrelevant. The mode of burial suggests a massacre or pestilence equally forcibly for Roman as for later times. The town which was destroyed in the first century stood mainly between Gracechurch Street and the Walbrook, and Spitalfields lies less than half a mile from this area to the north-east. It was customary for the Romans to bury their dead outside the inhabited area of the town and the wall of London was almost continuously surrounded by cemeteries. These extra-mural grounds seem to have been used throughout the occupation, although burials earlier than the last quarter of the fourth century are rare. Cremation appears to have been universal prior to 150 A.D., but in a time of crisis it is likely enough that inhumation should have been used to dispose of a large number of bodies. If we are really dealing with the victims of Boudicca's slaughter, the town must have been re-occupied within a few months of that event, since the exposed bodies

* Particulars of the history of Roman London are taken from: *An Inventory of the Historical Monuments in London.* Vol. III. *Roman London*, pp. 27—32, etc.

† *Annals*, Book XIV.

would have become disarticulated skeletons in a longer period. It is generally believed that the population of Roman London was a cosmopolitan one with Italians and Gauls predominating, but there is little positive evidence to define its racial constitution. In any case our burial-ground may only represent a quarter of the town which was racially more homogeneous than the population in general. The presence of a syphilitic skull would be considered by some to preclude the possibility of a Roman date. It might be suggested, too, by anyone who has handled the skulls that the bones are so well preserved that it is unlikely that they should have lain unprotected by coffins, and in the damp soil of London, for as long as 1500 years. A record relating to the Spital grounds has a direct bearing on this point*. In 1373 complaint was made that owing to the blocking of a watercourse "in winter time every year water a foot or more in depth flowed and rose in the Church of the Hospital of St Mary without Bisshopesgate, and in many of the houses there, as also, in many houses and gardens of the whole vicinity of Berwardeslane...." The burial-pits were dug in sand, but the situation is low-lying, and with a stratum of London clay beneath they may well have become water-logged at a time of such inundations. A few skulls of Roman date discovered in London, and now in the Guildhall Museum, are quite as well preserved as ours from Spitalfields and, in general, the condition of bone appears to be a very untrustworthy criterion of its age†.

It is quite clear that the date of the burials at Spitalfields cannot be determined with any approach to certainty from a study of the history of the site. We can only reach vague probabilities by such means, and no one of these can be nearly as valuable as the evidence which might have been provided by a few potsherds or coins. It appears from the above discussion that the burial-ground is unlikely to have been made during the time when the area formed part of the Old Artillery Ground. The evidence in favour of a mediaeval or Roman date suggests a greater probability and the latter alternative would seem to have a slight advantage. Under these circumstances a determination of the racial type of the population represented becomes a matter of peculiar importance, and this question is considered in the later sections of this paper.

(3) *The Nature of the Spitalfields Series.* The majority of the crania from Spitalfields Market which are available for study are in a fragmentary condition. There are isolated frontal and occipital bones, complete and incomplete calvariae, incomplete skulls and a few complete skulls. As always in such cases, the brain-box is represented by a far larger number of specimens than the facial skeleton.

* *Memorials of London and London Life in the XIIIth, XIVth and XVth Centuries, being a Series of Extracts, Local, Social and Political from the Early Archives of the City of London* A.D. *1276—1419.* Edited by H. T. Riley, 1868, pp. 374—375.

† An interesting example of this fact is furnished by an error made by Barnard Davis who was well acquainted with the condition in which excavated human skulls of all periods were found. Referring to the collection preserved in the crypt of St Leonard's at Hythe (see p. 245 below) he says (*Thesaurus Craniorum* (1867), pp. 45—46) that they are so well preserved that it is *quite impossible* to maintain that they can have been in their present position for as long as 330 years. The historical evidence showing that they have been there at least as long is quite adequate, however.

About 100 mandibles from the burial-ground were preserved, but hardly any of these can now be associated with particular skulls, and no measurements of the lower jaw have been taken. There is every reason to believe that nearly all the material was unbroken before 1926. The fragmentary state to which many of the skulls have been reduced is due almost entirely to the manner in which they were excavated in that year. A few of the higher lying skeletons may have been disturbed and broken during previous building operations, but it is probable that not a single specimen had been disintegrated by decay. The tables of almost all the bones are intact and unworn, and most of the fractured edges were clean-cut by the pickaxe or mechanical excavator. All the skulls are completely discoloured, both internally and externally, and a variety of dull colours can be found among them with brown predominating. In these respects the series appears to be perfectly homogeneous, and as regards the state of preservation and coloration there is little to distinguish it from the seventeenth-century London series from Moorfields, Whitechapel and Farringdon Street. In collecting the bones, no selection whatever was made except that fragments which could provide no usual measurements were discarded. The remains preserved were packed in nine wooden boxes and it is known that all in one box came from a restricted area of the whole burial-ground. The relative position of the areas represented by the different boxes is not known, however. The skulls were restored and numbered in the laboratory. There were 986 which are presumed to represent distinct individuals, but the true total may be rather less than this as there is no guarantee that some individuals are not represented more than once by cranial fragments which cannot now be associated with one another*. Of the total material 49 skulls (5·0 per cent.) were found to be juvenile, or immature, and there are none younger than about five years. It is probable that the proportion of non-adult individuals interred was considerably higher than this, as their remains would have been more easily destroyed, and young children may well have been present in considerable numbers. An attempt was made to sex as many as possible of the adult series. A queried sex was assigned to such fragments as isolated, but complete, frontal or occipital bones. There are 54 of the numbered fragments preserved, however, which are too incomplete to furnish an estimate of any value. It was thought advisable to retain as many specimens as possible, as there are few which are complete or nearly complete. These last would form too small a sample to yield reliable comparative results and they would also have been selected from a very much larger group, so that their average size and strength might well be superior to that of the sampled population. Including many doubtful cases, 590 males were distinguished (i.e. 66·8 per cent. of the sexed adult specimens) and 293 females (33·2 per cent.)†. The preponderance of the males may be partly due to the fact that their stronger skulls were more likely to be preserved, but, if the accuracy of this sexing is admitted, it is probable that considerably more men than women were

* The 105 skulls from Box I were numbered consecutively 1, 2, 3, ... 99*f*; the 102 from Box II, 100, 101, ... 199*b*, and so on.

† The proportion of male skulls to total adult sexed skulls only varies from 60·7 per cent.—73·1 per cent. for the nine boxes.

interred in the Spitalfields burial-ground. There are some statistical means of checking roughly the accuracy of anatomical sexing which can be used if the samples are large enough. Both male and female distributions of absolute measurements, and of the usual indices, should be fitted reasonably well by normal curves*. The P's found for the χ^2 goodness of fit test are given below for three characters:

	B		L		100 B/L	
	♂	♀	♂	♀	♂	♀
Probability P	·930	·988	·724	·692	·547	·659
No. of Groups	18	13	16	13	18	13
No. of Skulls	349	113	335	119	274	89

All the distributions considered are seen to be fitted excellently by normal curves. For the longest and most reliably sexed racial series which have hitherto been studied it has been found that there is no appreciable sexual difference in variability when comparisons are made between the coefficients of variation of the absolute measurements and the standard deviations of indices and angles. Constants for the present series are given in Table I. Comparisons can be made for 36 characters: the male variability is the greater in 16 cases, and the female the greater in the other 20. The difference only exceeds three times its probable error in a single case: the male standard deviation of the left orbital index exceeds the female by 1·26 and this is 3·5 times the probable error of the difference. If the sexing be accepted, the male and female variabilities of the Spitalfields series must be supposed to be approximately equal.

The sex ratios for different characters ought to be of the same order as values found for other long cranial series, of which the accuracy of the sexing has not been questioned, belonging to the same family of racial types. In the case of all the ratios given in Table II both male and female means are based on 50 or more individuals.

Compared with the other three series in Table II the Spitalfields sex ratio is the greatest for the characters L, B and S, but in each of these cases it exceeds the second greatest by a small and probably insignificant amount. The Spitalfields values are of the same order as the others in all cases. The mean measurements are given in Table III. There is a very satisfactory agreement between the male and female indices and angles. None of the differences is significant, except in the case of 100 O_2/O_1, R (Δ/p.e. $\Delta = 4{\cdot}6$), 100 O_2/O_1, L (5·5), 100 O_2/Lacry. O_1, L (3·4), 100 *fmb/fml* (3·8) and *Oc. I.* (8·5). Differences of the same sign as the ones now

* If two absolute measurements are normally distributed, the indices obtained by expressing one as a percentage of the other theoretically cannot form a normal distribution. It is found in practice, however, that the approach to normality is generally very close in such a case. See A. S. Merrill: "Frequency Distribution of an Index when both the Components follow the Normal Law." *Biometrika*, Vol. xx^A. 1928, pp. 53—63.

TABLE I.

Male and Female Constants of Variation for the Spitalfields Series.*

TABLE I.

Male and Female Constants of Variation for the Spitalfields Series.*

Character	Male		Female		Character	Male		Female	
	Standard Deviation	Coefficient of Variation	Standard Deviation	Coefficient of Variation		Standard Deviation	Coefficient of Variation	Standard Deviation	Coefficient of Variation
C†	125·5 ±7·3	8·87± ·52	—	—	EH	2·11± ·17	18·34±1·51	—	—
F	6·16± ·16	3·46± ·09	6·23± ·28	3·64± ·16	O_1R	1·70± ·08	4·00± ·18	1·76± ·15	4·37± ·37
F. V. L.	6·50± ·29	3·62± ·16	—	—	O_1L	1·64± ·07	3·91± ·17	1·61± ·14	4·03± ·35
L	6·40± ·17	3·54± ·09	6·14± ·27	3·58± ·16	$O_1'R$	1·89± ·14	4·68± ·35	—	—
B	5·79± ·15	4·02± ·11	5·39± ·24	3·92± ·18	$O_1'L$	1·74± ·12	4·36± ·31	—	—
IOW	3·43± ·10	3·50± ·10	3·42± ·16	3·66± ·17	Lacrymal O_1R	2·00± ·17	5·12± ·43	—	—
B'	4·58± ·12	4·68± ·13	4·16± ·17	4·44± ·18	Lacrymal O_1L	1·57± ·12	4·09± ·32	—	—
B''	5·39± ·17	4·38± ·14	4·74± ·25	4·04± ·21	O_2R	1·86± ·08	5·71± ·25	1·98± ·17	6·28± ·53
H'	5·34± ·17	4·02± ·13	4·65± ·30	3·68± ·24	O_2L	1·85± ·08	5·66± ·24	1·85± ·15	5·79± ·48
H	5·11± ·23	3·86± ·18	—	—	100 B/L	3·84± ·11	—	3·81± ·19	—
Bregmatic OH	4·01± ·17	3·50± ·15	—	—	100 B/F. V. L.	3·81± ·17	—	—	—
OH	4·22± ·18	3·66± ·16	—	—	100 H'/L	3·21± ·11	—	2·84± ·20	—
LB	3·91± ·14	3·89± ·14	3·32± ·22	3·49± ·24	100 H/L	3·23± ·15	—	—	—
S_1'	4·49± ·11	4·02± ·11	4·36± ·18	4·09± ·20	100 H/F. V. L.	3·30± ·15	—	—	—
S_2'	5·97± ·14	5·36± ·12	5·70± ·22	5·38± ·21	100 B/H'	5·38± ·19	—	4·71± ·34	—
S_3'	4·95± ·12	5·16± ·12	4·85± ·19	5·20± ·21	100 B/H	5·02± ·24	—	—	—
S_1	6·03± ·15	4·74± ·12	6·05± ·25	4·99± ·21	100 $(B-H')/L$	3·75± ·13	—	3·45± ·26	—
S_2	7·41± ·17	5·96± ·14	7·34± ·29	6·24± ·25	100 $G'H/GB$	4·93± ·30	—	—	—
S_3	6·81± ·16	5·88± ·14	6·65± ·27	6·00± ·24	100 NB/NH, R	3·96± ·19	—	—	—
S	12·97± ·40	3·52± ·11	12·10± ·67	3·45± ·19	100 NB/NH, L	4·30± ·20	—	—	—
U	14·09± ·49	2·73± ·10	15·17±1·22	3·08± ·31	100 NB/NH'	4·53± ·22	—	—	—
Q'	11·12± ·51	3·49± ·16	—	—	100 SS/SC	11·79± ·50	—	11·63± ·97	—
Bregmatic Q'	10·37± ·35	3·26± ·11	11·06± ·83	3·69± ·28	100 G_2/G_1	5·09± ·43	—	—	—
Broca's Q'	11·03± ·37	3·58± ·12	10·13± ·76	3·46± ·26	100 G_2/G_1'	5·70± ·47	—	—	—
Biasterionic B	4·31± ·14	3·88± ·12	4·84± ·26	4·55± ·24	100 EH/G_2	4·75± ·39	—	—	—
fml	2·50± ·07	7·14± ·21	2·41± ·13	6·97± ·39	100 O_2/O_1, R	4·38± ·20	—	3·71± ·31	—
fmb	2·05± ·06	6·93± ·22	2·37± ·13	8·39± ·48	100 O_2/O_1, L	4·66± ·20	—	3·40± ·30	—
$G'H$	3·91± ·19	5·65± ·28	—	—	100 O_2/O_1', R	5·86± ·44	—	—	—
GL	4·94± ·26	5·18± ·28	—	—	100 O_2/O_1', L	5·43± ·38	—	—	—
GB	3·85± ·20	3·98± ·21	—	—	100 O_2/Lacry. O_1, R	6·41± ·53	—	—	—
J	5·46± ·28	4·14± ·21	—	—	100 O_2/Lacry. O_1, L	5·27± ·41	—	—	—
NH, R	2·95± ·13	5·90± ·26	—	—	100 fmb/fml	5·40± ·17	—	6·53± ·37	—
NH, L	2·95± ·13	5·90± ·26	—	—	$Oc.\ I.$	2·55± ·06	—	2·93± ·12	—
NH'	2·97± ·14	6·15± ·28	—	—	$N\angle$	3°·62± ·20	—	—	—
NB	1·81± ·08	7·27± ·33	—	—	$A\angle$	3°·10± ·17	—	—	—
SS	1·21± ·05	26·89±1·21	0·87± ·07	20·71±1·76	$B\angle$	2°·62± ·14	—	—	—
SC	1·90± ·08	19·59± ·86	2·04± ·17	21·47±1·92	Alveolar $P\angle$	3°·47± ·19	—	—	—
G_1	2·76± ·14	5·56± ·28	—	—	Prosthion $P\angle$	3°·40± ·18	—	—	—
G_1'	2·35± ·12	5·21± ·27	—	—	$\theta_1\angle$	3°·00± ·18	—	—	—
G_2	2·23± ·17	5·36± ·42	—	—	$\theta_2\angle$	3°·05± ·18	—	—	—

* Constants are not given for characters which could only be measured on fewer than 30 skulls. The number available in the case of any particular character is given in Table III.

† The index letters denoting measurements are defined in Appendix I.

TABLE II.

Sex Ratios for the Spitalfields and other Series.

Character	Spitalfields	Whitechapel English *	Farringdon St English †	Bavarians Altbayerisch ‡
L	1·052	1·048	1·040	1·041
B	1·050	1·045	1·049	1·045
B'	1·044	1·053	1·038	1·049
H'	1·053	1·059	1·059	1·045‡
LB	1·058	1·066	1·045	1·047
S	1·051	1·039	1·046	1·033

found are customarily observed in the case of all these indices except the foraminal, so we are fully justified in asserting that the male and female samples represent the same racial type. It seems that the sexing of the Spitalfields material is not seriously in error. A certain number of specimens have almost certainly been assigned to the wrong group, as is unavoidable in anatomical sexing, but this may make no appreciable difference to the mean measurements, or to the form of the distributions. There is a preponderance of male skulls. Healed wounds were found on 18 specimens: 17 of these had been supposed "male" or "male ?"

The fact that there is a satisfactory agreement between the male and female indices and angles does not prove that the population represented was racially homogeneous. Significant differences may be found between the groups which were taken from different parts of the burial-ground. To test this the male means of the 10 calvarial absolute measurements and 5 indices which can be given for the largest numbers of skulls were computed for each group, or box. The coefficients of racial likeness§

* Macdonell: *Biometrika*, Vol. III. 1904, pp. 208—209.

† Hooke: *Ibid.* Vol. XVIII. 1926, p. 28.

‡ Ranke: *Beiträge zur Anthropologie und Urgeschichte Bayerns*, Bd. III.—V. 1880—1884. The height ratio is for the vertical measurement (*H*) in place of the basio-bregmatic (*H'*).

§ Karl Pearson: "On the Coefficient of Racial Likeness." *Biometrika*, Vol. XVIII. 1926, pp. 105—117. The Farringdon Street standard deviations (*Ibid.* p. 40) were used in the present paper, unless otherwise stated, and the term $\frac{1}{M}$, which is invariably small, has been neglected. With the usual notation, the form of the coefficient used is:

$$\frac{1}{M}\Sigma\left(\frac{n_s n_{s'}}{n_s+n_{s'}}\times\frac{(m_s-m_{s'})^2}{\sigma_s^2}\right)-1\pm\cdot67449\sqrt{\frac{2}{M}}=\frac{1}{M}\Sigma\,(a)-1\pm\cdot67449\sqrt{\frac{2}{M}}.$$

Values calculated from this formula are called "crude" coefficients. It has been shown that the value of the crude coefficient is affected by the sizes of the samples compared if the two types differ significantly from one another, and in this case a better measure of their absolute divergence is obtained by reducing the crude coefficient to the value it would have if all mean characters for both samples were based on 100 individuals. (Karl Pearson: "Note on Standardisation of Method of using the Coefficient of Racial Likeness." *Ibid.* Vol. XX[B] (1928), pp. 376—378.) If $\bar{n}_s$ is the mean number of skulls available for the characters used in the case of the first series, and $\bar{n}_{s'}$ is the same for the second series, then the "reduced" coefficient is defined to be

$$50\times\frac{\bar{n}_s+\bar{n}_{s'}}{\bar{n}_s\bar{n}_{s'}}\left\{\frac{1}{M}\Sigma\,(a)-1\right\}\pm\cdot67449\sqrt{\frac{2}{M}}\times50\times\frac{\bar{n}_s+\bar{n}_{s'}}{\bar{n}_s\bar{n}_{s'}}.$$

These reduced coefficients may be compared directly with one another.

TABLE III.

Mean Male and Female Measurements of the Spitalfields Series.

Character	Male		Female		Character	Male		Female	
	Mean	No.	Mean	No.		Mean	No.	Mean	No.
*C**	1415·7 ± 10·3	68	1245·7 ± 15·9	15	G_2	41·6 ± ·24	38	40·8 ± ·40	9
F	178·2 ± ·23	318	171·3 ± ·40	113	*EH*	11·5 ± ·24	36	10·6 ± ·67	9
F. V. L.	179·5 ± ·39	124	169·2 ± ·85	23	O_1R	42·5 ± ·11	109	40·2 ± ·21	32
L	180·7 ± ·24	335	171·8 ± ·38	119	O_1L	42·0 ± ·10	122	39·9 ± ·20	30
B	144·1 ± ·21	349	137·3 ± ·34	113	$O_1'R$	40·4 ± ·20	41	38·7 ± ·30	13
IOW	98·0 ± ·14	264	93·5 ± ·23	103	$O_1'L$	39·9 ± ·17	46	38·4 ± ·35	16
B'	97·8 ± ·17	316	93·7 ± ·24	139	Lacrymal O_1R	39·1 ± ·23	33	37·1 ± ·34	11
B"	123·0 ± ·24	237	117·4 ± ·36	81	Lacrymal O_1L	38·4 ± ·17	38	37·0 ± ·36	13
H'	132·9 ± ·25	215	126·2 ± ·43	54	O_2R	32·6 ± ·11	124	31·5 ± ·24	32
H	132·5 ± ·33	110	124·5 ± ·72	23	O_2L	32·7 ± ·11	128	31·9 ± ·22	33
Bregmatic *OH*	114·6 ± ·24	124	108·3 ± ·65	23	100 *B*/*L*	79·4 ± ·16	274	79·8 ± ·27	89
OH	115·2 ± ·26	122	108·9 ± ·65	24	100 *B*/F. V. L.	80·2 ± ·24	114	79·5 ± ·55	20
LB	100·5 ± ·19	188	95·0 ± ·32	50	100 *H'*/*L*	73·7 ± ·15	198	73·7 ± ·28	47
S_1'	111·6 ± ·16	352	106·6 ± ·27	131	100 *H*/*L*	73·5 ± ·21	109	73·6 ± ·47	21
S_2'	111·3 ± ·20	425	106·0 ± ·32	148	100 *H*/F. V. L.	73·9 ± ·21	108	73·7 ± ·47	21
S_2''	95·9 ± ·16	413	93·2 ± ·27	144	100 *B*/*H'*	108·2 ± ·20	192	108·4 ± ·49	44
S_1	127·3 ± ·22	352	121·3 ± ·37	131	100 *B*/*H*	108·4 ± ·34	102	108·2 ± ·81	19
S_2	124·4 ± ·24	429	117·7 ± ·41	146	100 (*B* − *H'*)/*L*	6·0 ± ·19	177	6·1 ± ·36	41
S_3	115·9 ± ·23	410	110·8 ± ·38	143	100 *G'H*/*GB*	74·3 ± ·42	62	73·1 ± ·83	19
S	368·5 ± ·56	241	350·5 ± ·94	75	100 *NB*/*NH*, *R*	50·0 ± ·26	104	50·1 ± ·54	27
U	517·0 ± ·70	185	492·8 ± 1·67	35	100 *NB*/*NH*, *L*	50·0 ± ·28	107	50·5 ± ·54	27
Q'	318·9 ± ·72	108	301·3 ± 2·05	16	100 *NB*/*NH'*	52·0 ± ·31	98	52·4 ± ·66	27
Bregmatic *Q'*	317·8 ± ·49	202	300·0 ± 1·18	40	100 *DS*/*DC*	53·9 ± 1·28	25	53·3 ± 1·15	10
Broca's *Q'*	308·2 ± ·52	203	293·1 ± 1·08	40	100 *SS*/*SC*	47·4 ± ·71	126	45·3 ± 1·41	31
Biasterionic *B*	111·1 ± ·19	230	106·4 ± ·36	80	100 G_2/G_1	84·1 ± ·61	32	87·7 ± 1·91	6
fml	35·0 ± ·11	255	34·6 ± ·19	75	100 G_2/G_1'	92·2 ± ·67	33	95·9 ± 1·79	7
fmb	29·6 ± ·09	227	28·3 ± ·19	71	100 EH/G_2	27·2 ± ·56	33	26·8 ± 1·84	8
G'H	69·2 ± ·27	95	64·5 ± ·54	25	100 O_2/O_1, *R*	76·9 ± ·29	106	79·3 ± ·44	32
GL	95·3 ± ·37	80	89·2 ± ·59	22	100 O_2/O_1, *L*	77·8 ± ·29	120	80·6 ± ·42	30
GB	93·7 ± ·28	85	88·3 ± ·83	22	100 O_2/O_1', *R*	79·8 ± ·62	41	81·5 ± ·71	13
J	131·9 ± ·40	85	122·9 ± ·80	14	100 O_2/O_1', *L*	81·5 ± ·54	46	83·9 ± ·61	15
NH, *R*	50·0 ± ·19	115	47·5 ± ·37	29	100 O_2/Lacry. O_1, *R*	82·0 ± ·75	33	84·6 ± ·72	11
NH, *L*	50·0 ± ·18	118	47·0 ± ·35	28	100 O_2/Lacry. O_1, *L*	83·5 ± ·58	38	87·0 ± ·86	12
NH'	48·3 ± ·19	107	45·3 ± ·37	28	100 *fmb*/*fml*	84·5 ± ·24	227	82·3 ± ·53	69
NB	24·9 ± ·11	114	23·5 ± ·26	28	*Oc. I.*	59·8 ± ·08	409	61·4 ± ·17	142
DS	12·4 ± ·22	25	11·0 ± ·23	10	*N* ∠	65°·4 ± ·28	76	65°·4 ± ·51	20
DC	23·2 ± ·28	27	21·0 ± ·60	11	*A* ∠	73°·6 ± ·24	76	73°·8 ± ·48	20
DA	38·3 ± ·50	24	35·1 ± ·68	10	*B* ∠	41°·0 ± ·20	76	40°·8 ± ·42	20
SS	4·5 ± ·07	126	4·2 ± ·11	31	Alveolar *P* ∠	85°·8 ± ·27	75	85°·6 ± ·58	20
SC	9·7 ± ·11	128	9·5 ± ·25	31	Prosthion *P* ∠	84°·4 ± ·26	77	84°·5 ± ·57	20
G_1	49·6 ± ·20	88	46·3 ± ·38	17	θ_1 ∠	29°·1 ± ·25	66	29°·1 ± ·45	18
G_1'	45·1 ± ·17	86	42·3 ± ·28	17	θ_2 ∠	11°·7 ± ·25	66	11°·5 ± ·48	18

* The index letters denoting measurements are defined in Appendix I.

were then computed between every possible pair of boxes, using the standard deviations given for the seventeenth-century London series from Farringdon Street. The mean numbers of skulls available for the 15 characters used range for the nine boxes from 23·7—35·5. The lowest coefficient found was $-0·65 \pm ·25$ and the highest $+0·41 \pm ·25$. The last does not differ significantly from zero, so there

is ample justification for assuming that each one of the groups represents identically the same population which is perfectly homogeneous as far as can be told by these means*. There is still a possibility that the total sample is racially heterogeneous, since a mixture of types may have been uniformly distributed over the burial-ground. This point may be investigated, in the usual way, by comparing the variability of the whole series with that of other European ones which are presumed to be racially homogeneous in the sense that they are so thoroughly hybridised that their original types cannot now be separated. A summary of the comparison of the coefficients of variation of absolute measurements and the standard deviations of indices and angles is made in the table below with two English and a Basque series.

		No. of characters with greater variabilities than Spitalfields	No. of characters with smaller variabilities than Spitalfields	No. of characters compared
Farringdon St English† ...	♂	35 (77·8 %)	10 (22·2 %)	45
	♀	12 (66·7 %)	6 (33·3 %)	18
Whitechapel English‡ ...	♂	18 (60·0 %)	12 (40·0 %)	30
	♀	5 (50·0 %)	5 (50·0 %)	10
Basques§ ...	♂	14 (43·7 %)	18 (56·3 %)	32

Constants based on fewer than 40 skulls were excluded and only one calvarial length (L), one calvarial height (H'), one nasal height (NH' or NH, R), one orbital breadth (O_1R or O_1', R) and one orbital height were used. Similar restrictions were made in other cases to prevent the duplication of very similar measurements.

No exact comparison can be made between the percentages given as the group of characters is not the same in each case, but there is a clear suggestion that the Spitalfields series is less variable than the other two London ones and more variable than the Basques. The last is more homogeneous than any other European cranial

* The evidence of homogeneity afforded by the coefficients appears at first to be too good. There are 28 negative values and only eight positive. The mean coefficient is $-0{\cdot}21 \pm {\cdot}04$ and this is *significantly* negative. This anomalous state of affairs appears to be due partly to the fact that the Farringdon Street standard deviations were used. These are greater, on the average, than the Spitalfields constants, so the use of the latter would tend to increase the values of the coefficients. The relative positions of the areas of the burial-ground represented by the boxes is not known, but it was thought worth while to compare two larger groups of the total material. Between the pooled boxes I—IV (106·0) and the pooled boxes V—IX (147·7) a coefficient of $-0{\cdot}37 \pm {\cdot}25$ was found for the 15 characters referred to in the text. This is the lowest coefficient of racial likeness that has yet been found for such long cranial series.

† Hooke: *Biometrika*, Vol. XVIII. 1926, p. 40.

‡ Macdonell: *Ibid.* Vol. III. 1904, p. 222.

§ Morant: *Ibid.* Vol. XXI. 1929, p. 76.

series with which it can be compared*, so there is quite sufficient justification for considering the Spitalfields series to be as racially homogeneous as most others from European burial-grounds. Few of the differences in variability considered above are definitely significant, and there is no character for which the male Spitalfields variability exceeds the greatest value for one of the other three series by more than twice the probable error of the difference. The single character having a peculiarly small variability for the Spitalfields series is the facial breadth (*GB*). The male coefficient of variation is 3·98 ± ·21 and the next lowest for the three series with which comparison is made is 5·39 ± ·32. The difference of 1·41 between these is 3·7 times its probable error.

Detailed measurements of the juvenile and adolescent skulls were not taken, but the calvarial length, breadth and height of 29 of the more complete specimens give: 100 $B/L = 78{\cdot}7$ (26), 100$H'/L = 75{\cdot}4$ (15) and 100 $B/H' = 106{\cdot}7$ (16). The corresponding male adult means are 79·4, 73·7 and 108·2, and the female 79·8, 73·7 and 108·4. There is every reason to believe that the immature individuals belong to the same race as the adults.

A rough attempt to estimate the age constitution of the adult population was made by considering the state of the coronal, sagittal and lambdoid sutures. The following proportions are found for the two sexes:

	Sutures open	Sutures beginning to close or partly closed	All sutures closed	Total examined
♂	103 (19·3 %)	301 (56·3 %)	131 (24·5 %)	535
♀	121 (49·4 %)	94 (38·4 %)	30 (12·2 %)	245

It is known that the sutures of male skulls normally close at an earlier age than those of female specimens†, so there is no evidence in the present case of a sexual difference between the age constitutions of the two samples. The ages are represented in much the same proportions as in the Hythe and Whitechapel series. Of neither of these latter series can we say with certainty whether the deaths resulted from an epidemic or occurred in the ordinary course of mortality.

(4) *Remarks on Anomalies.* All the Spitalfields skulls were examined carefully for anomalies and the remarks are included in the appended tables of individual measurements. It is important to bear in mind that the majority of the specimens are fragmentary, and the frequency with which a particular anomalous condition occurs can only be known if the total which might have been affected is also recorded. This was only done in the case of a few selected conditions.

* Means, individual measurements and constants of variation have recently been provided for a series of 280 male and 135 female Austrian skulls (H. L. Shapiro: "Contributions to the Craniology of Central Europe. I. Crania from Greifenberg in Carinthia." *Anthropological Papers of the American Museum of Natural History*, Vol. xxxi. Part i. 1929). Unfortunately an uncertain number of specimens of doubtful sex were excluded. The variabilities tend to be greater than those of the Spitalfields series.

† See J. Frédéric: "Untersuchungen über die normale Obliteration der Schadelnähte." *Zeitschrift für Morphologie und Anthropologie*, Bd. ix. 1906, p. 439.

(*a*) *Sutures.* The condition of the coronal, sagittal and lambdoid sutures was examined in each skull. If no remark is made, it may be assumed that any one of these is open for its whole length, if present at all. The suture as a whole is referred to and it may be said to be "closing," "closed" or "obliterated," or approaching one of these conditions. A rough estimate of the male and female age distributions based on this evidence has already been considered. The order in which the main sutures were closing shows little variation. The sagittal was invariably the first, or one of the first, to close but for a single exception. In one case (No. 342 ♂: Plate IV *a*) the coronal, sagittal and right side of the lambdoid suture are clearly open, but the left side of the last is obliterated for the upper three-quarters of its length, though open near the asterion. This skull is metopic and quite symmetrical. In a few other cases the state of closure of the coronal or lambdoid suture appears as advanced as that of the sagittal, but in the vast majority the sagittal was the first to begin synostosis. The obelion section was invariably the first to close and this was occasionally obliterated while the anterior section remained clearly open. It was usual in this population for the lambdoid and coronal sutures to begin closing after the sagittal and at approximately the same time as one another. The order most frequently found is: sagittal—lambdoid—coronal, but the sequence: sagittal—coronal—lambdoid is met with nearly as often. Two skulls show precisely the same abnormal condition (No. 6 ♀ and No. 209 ♂): the occipito-mastoid suture is completely obliterated on the right side, though the same on the left, and all other sutures, are clearly open. Both are slightly asymmetrical. An anomaly which appears to be rarer is exhibited by a male specimen (No. 855) which is, unfortunately, largely defective. It is ageing, as the sagittal suture is nearly obliterated, the coronal closed and the lambdoid open. The temporals are completely fused to the parietal bones and not a trace of the suture can be seen on either side. At the same time the occipito-mastoid sutures are clearly open. The conditions of the connections between the temporals and the sphenoid cannot be observed. Traces of sutures between the ex- and supra-occipitals were observed in two cases (No. 627 ♂ and No. 703 ♂). The presence of the persistent frontal suture was noted. Contact between the frontal and parietal bones is denoted by $LF+RP$ or $RF+LP$, and the length of the suture between the pair connected is given. The following frequencies are found for complete metopic sutures, the specimens which only show traces near the nasion or bregma being excluded:

	$LF+RP$	$RF+LP$	Join at Bregma	Parietal connection not known	Total possible	Total metopic
♀	16	4	1	3	213	24 (11·3 %)
♂	21	6	6	5	455	38 (8·4 %)

The fact that contact is most frequently made between the left frontal and right parietal bones has been observed in the case of every other long series examined in this way. It is customary, also, to find that the frequency of occurrence of the suture

is slightly higher for female than for male skulls. Percentages as high as the ones now given have apparently only been recorded for European races*.

It has been observed by several craniometricians that some mean breadth measurements of metopic skulls are greater than the means for the non-metopic specimens in the same series. The following differences are found for the Spitalfields crania:

		Internal bi-orbital breadth (*IOW*)	Minimum frontal breadth (*B'*)	Maximum frontal breadth (*B''*)	Maximum calvarial breadth (*B*)	Biasterionic breadth
♂	Metopic skulls (*A*)	98·9 (21)	100·4 (24)	126·7 (19)	144·1 (24)	109·4 (15)
	Non-metopic skulls (*B*)	97·9 (243)	97·6 (292)	122·7 (218)	144·0 (325)	111·2 (215)
	A − *B*	+1·0	+2·8	+4·0	+0·1	−1·8
♀	Metopic skulls (*A*)	94·7 (11)	95·6 (16)	119·4 (14)	135·6 (11)	102·4 (10)
	Non-metopic skulls (*B*)	93·4 (92)	93·5 (123)	117·0 (67)	137·6 (102)	107·0 (70)
	A − *B*	+1·3	+2·1	+2·4	−2·0	−4·6

Differences of the same order as these were found by Miss Hooke for the *B*'s and *B''*s of the three seventeenth-century London series†. In M. Papillault's memoir on the metopic suture‡ the means of 50 male and 40 female metopic Parisian skulls are compared with the means for the same numbers of non-metopic skulls in the same series. The amounts by which the first exceed the second in the case of the males are: *B''* 7·4, *B'* 3·4, *B* 2·0, biasterionic *B* 0·0, and for the females: *B''* 5·2, *B'* 4·2, *B* 1·2 and biasterionic *B* 0·8. These differences are all larger in a positive sense than the corresponding ones for the Spitalfields series, but the maximum frontal breadth shows the greatest difference and the biasterionic the least in both cases. Whether the last is significantly negative, or not, could only be decided satisfactorily from the study of a longer series.

One case of a nearly obliterated horizontal suture across the left malar bone was noted (No. 46 ♂). In general the calvarial sutures are complex and cases of extreme complexity are recorded.

(*b*) *Supernumerary Bones.* As is usual for European series, wormian bones in the lambdoid suture are common, more than 50 per cent. of the skulls having one or more. Ossicles in the sagittal and coronal sutures are rare and all small. There are seven skulls with a small ossicle of bregma (Nos. 180, 233, 326, 563, 641 and 708 ♂, 632 ♀). The presence of epipteric bones has been recorded. True interparietal bones—accepting as such only cases where the transverse occipital suture, or the

* See the table given by Rudolf Martin: *Lehrbuch der Anthropologie*, Jena, 1914, p. 755.

† *Biometrika*, Vol. XVIII. 1926, pp. 19—20.

‡ "La suture métopique et ses rapports avec la morphologie cranienne." *Mémoires de la Société d'Anthropologie de Paris*, 3e série, Tome II (1896).

part of it which remains, meets the lambdoid close to the asterion—are rare. Only one was found among 220 female skulls (0·5 per cent.) and 8 among 497 male skulls (1·6 per cent.). The female specimen (No. 52) has a single *os triangulare* of the usual size on the right side and two male skulls show the same condition (Nos. 323 and 499 *G*). Two others (Nos. 312 and 365) show a single *os triangulare* of the usual size on the left side; one (No. 78) has both *ossa triangularia* only separate and of the usual size, and another (No. 606) has the complete tripartite form. The two remaining cases show more unusual forms: they both appear to be examples of enlarged *ossa triangularia* symmetrically placed. The median sutures of the supernumerary bones approach within 20 mm. of one another in one case (No. 221) and there is an ossicle of lambda: in the other (No. 424) the bones meet below the lambda and they have a common suture for a length of 9 mm. There are also examples of the *os épactal*, which is distinguished from the true interparietal by the fact that the transverse occipital suture is well removed from the biasterionic diameter*. The bone has the bipartite form with the vertical suture in, or close to, the median sagittal plane in six cases (Nos. 3, 41, 642, 663 and 757 ♂, 421 ♀), and in another it is undivided (No. 708 ♂). An unusually large ossicle of lambda asymmetrically placed was also observed (No. 659 ♂). A female skull (No. 510) has a small ossicle between the temporal squama and parietal bone on both sides, and a male specimen (No. 46) has one in a similar position on the left side only.

(*c*) *Teeth.* The majority of the extant palates of the Spitalfields skulls are imperfect. Remarks in the appended tables of individual measurements relate to the state of wear of the teeth, the number lost before death, diseased specimens and abnormal arrangements. Considerable variation is found in the condition of the dentitions, but most belonging to fully adult individuals are considerably worn and imperfect. There are a few aged specimens with no teeth lost before death. Caries and deposits of tartar are fairly common, and several cases of the absence of third molars are recorded. One skull (No. 27 ♂) has a single premolar on the right side (Plate V *a*); another (No. 714 ♀) has a single premolar on the left side (Plate V *b*). A male specimen (No. 802) shows the absence of both canines and of the first left molar (Plate VI *b*). The spaces for the missing teeth are left unfilled on the left, but there is no room for the right canine. An unerupted tooth (canine?) is below the inner alveolar borders of the left incisors. This skull is beginning to age and the teeth *in situ* are markedly worn. No. 56 (♂) has an unusually small third molar (Plate V *c*). No. 432 (♀) has no third molar on the left side while the second molar is carious and quite unworn; on the right all the teeth are markedly worn except the third molar (Plate V *d*). No. 705 (♂) has a prominent socket of the first right incisor and the root of the tooth appears to have been exposed during life (Plate VI *c*). No. 507 (♂) shows all molars lost before death and the alveoli completely absorbed; there is a large bony abscess at the socket of the right third molar and a small one at the socket of the left third molar (Plate VI *a*).

* A.-F. le Double: *Traité des variations des os du crâne de l'homme.* Paris (1903), pp. 55, 60 and 61.

(*d*) *The Base of the Skull.* The sizes of the jugular foramina were compared when possible. This feature is denoted by *JR* or *JL*, according as the right or left is the greater, or by *J* =. The following frequencies are found:

	JR	*J* =	*JL*
♂	84 (51·2 %)	39 (23·8 %)	41 (25·0 %)
♀	24 (57·1 %)	5 (11·9 %)	13 (31·0 %)

The balance in favour of the right side has been observed for every series that has been examined in this way. Complete division of the jugular foramen has been noted, and also the presence of precondyles, tympanic perforations and the fossa pharyngea. There is one fused atlas (No. 145 ♂), the union posterior to the condyles being almost complete. Two complete bridges joining the lateral pterygoid plate to the spina angularis of the sphenoid are recorded (Nos. 103 and 111 ♂), and incomplete bridges were observed on several skulls. Unusually prominent external occipital crests were found on two specimens (Nos. 410 and 749 ♂: Plate VII *e*). An unusually large mastoid foramen is shown on the right side of one skull (No. 865 ♂) and on the left side of another (No. 129 ♂). No. 200 ♂ has a paroccipital process on either side (Plate VII *a*), the one on the right being blunt with an irregular articular surface and the one on the left forming a spine of which the tip is defective. There is also a large precondyle on the right side and a small one on the left. Several cases of the foramen magnum being markedly asymmetrical, or having the margin posterior to the condyles rugged and irregular, are recorded. A female skull (No. 217) has two large and joined precondyles with distinct articular surfaces (Plate VII *c*). Another (No. 108 ♂) has condyles with double and irregular articular surfaces (Plate VII *d*), and a suggestion of this condition was noted in other cases. Two skulls have processes projecting posterior to the basion: in one (No. 142 ♀) this has the form of an articular surface and in the other (No. 48 ♀: Plate VII *b*) it is a small spine. There is only one clear example of a basi-occipital surface having several fossae (No. 208 ♂), and none of incisures.

(*e*) *Other Anomalies.* Three male skulls have the fronto-temporal articulation: No. 623 has connection on both sides, No. 400 on the left only and No. 200 on the right complete and a process of the temporal which nearly reaches the frontal on the left. No. 116 (♂) has a styliform process 14 mm. long on the left temporal squama. An anomaly which appears to be extremely rare is shown by a male skull (No. 846: Plate VI *d*): this is the complete absence of the posterior wall of the right auricular passage. The passage on the left side is normal. Several cases of marked calvarial asymmetry are recorded. Mention is also made of healed wounds and exostoses. There are several of the latter, but they are all small. A female skull (No. 834) has unusually large parietal foramina. In general the transverse section of the vault is perfectly smooth, but three male crania have low median sagittal ridges (Nos. 258, 514 and 717) and a female (No. 212: Plate IV *b*) shows the same form

rather more accentuated. A depression at the obelion is met with fairly frequently, but there is no case of a marked flattening of that region. There are no examples of a post-coronal depression, a transverse occipital groove, or a divided parietal bone.

(*f*) *Diseased Skulls.* In so far as their state of preservation and racial characters are concerned, there is nothing whatever to distinguish the skulls referred to below from others in the Spitalfields series, and there is every reason to believe that they represent the same population. Owing to its pathological condition the measurements of the first specimen were not used in computing the means and standard deviations, but no others have been excluded for this reason. No. 131 (Plate III*a*) is affected by advanced syphilis which was almost certainly the cause of death. It is probably female. The three main sutures are obliterated, but the teeth are only slightly worn. Nearly all the surfaces of the frontal and parietal bones are eroded and there is a hole in the frontal. The mastoid region of the right temporal is also affected, but the left temporal bone was untouched. The left side of the facial skeleton is missing. The right malar has been excavated by the disease. There is only one other Spitalfields skull which bears unmistakable traces of disease. This is an incomplete calvaria, having all sutures open (No. 374 ♀, Plate III *b* and *c*), with the right temporal, the base and a large part of the frontal bone defective. There are three distinct areas affected, one on each of the frontal and parietal bones and a depression on the right parietal may be the beginning of another centre. The condition of the bone can be seen from the photographs. Externally the table has been removed and the surface below has a spongy appearance. The endocranial areas are inflamed and considerably larger than the corresponding extocranial ones. As the action has been principally internal it is unlikely that this is a case of incipient syphilis. A very different condition is shown by another incomplete calvaria (No. 573 ♂). This is an ageing specimen with coronal, sagittal and lambdoid sutures nearly obliterated. The frontal, parietal and occipital bones have their tables perforated in a number of places. The holes are more numerous internally than externally and a few of them pass through both tables. There is no sign of inflammation whatever. There are a few similar perforations on the base of the skull. This condition is remarkably similar to that occasionally found among dynastic Egyptian skulls and it has been said to be due to beetles eating the bone after death*. As far as is known, not a single case of this kind has previously been recorded for a specimen derived from a European burial-ground.

(5) *Comparisons with British Cranial Series.* Comparisons between the Spitalfields and the following seven series were made by the method of the coefficient of racial likeness.

(*a*) *Whitechapel.* W. R. Macdonell: "A Study of the Variation and Correlation of the Human Skull, with Special Reference to English Crania," *Biometrika*, Vol. III.

* Cf. *The Archaeological Survey of Nubia, Report for 1907—1908. Plates Accompanying Volume II.* Cairo (1910). Plate XXX, Fig. 2; and G. Elliot Smith: "The alleged Discovery of Syphilis in Prehistoric Egyptians." *The Lancet*, August 22nd (1908), p. 521.

1904, pp. 191—244. A few additional measurements are given in *Ibid.* Vol. XVIII. 1926, pp. 28 and 29. The series came from a single seventeenth-century London burial-pit.

(*b*) *Moorfields.* W. R. Macdonell: "A Second Study of the English Skull, with Special Reference to Moorfields Crania." *Ibid.* Vol. v. 1906, pp. 86—104. The series came from a single seventeenth-century London burial-pit.

(*c*) *Farringdon Street.* B. G. E. Hooke: "A Third Study of the English Skull, with Special Reference to the Farringdon Street Crania." *Ibid.* Vol. XVIII. 1926, pp. 1—55. The series came from a London burial-ground used in the seventeenth century.

(*d*) *British Neolithic.* G. M. Morant: "A First Study of the Craniology of England and Scotland from Neolithic to Early Historic Times, with Special Reference to the Anglo-Saxon Skulls in London Museums." *Ibid.* pp. 56—98. The means were obtained by pooling the measurements of a number of workers. Revised values are given in *Biometrika*, Vol. XX[B]. 1928, pp. 372—373. The skulls came from various scattered localities, England being better represented than Scotland.

(*e*) *English Bronze Age. Ibid.* The pooled means are presumed to represent the type of the Bronze Age invaders, the neolithic element having been eliminated by approximate methods. The majority of the skulls were found in the Midlands and north of England. Revised means were given in 1928.

(*f*) *British Iron Age. Ibid.* The pooled means represent the south of England better than the north, and England as a whole better than Scotland. The majority of the specimens are of Romano-British date. Revised means were given in 1928.

(*g*) *Anglo-Saxon. Ibid.*

Although some of the above series are very inadequate, they are the best available representing the population of England at different epochs. Coefficients of racial likeness for different groups of characters* are given in Table IV, and comparisons with the female Spitalfields means can only be made in the case of five of the seven series. The values based on all available of the 31 characters, and on the calvarial characters alone, are all of a high order, indicating distinct racial divergence. The same is found when measures of shape—the indices and angles—are considered alone, except that there is a marked reduction of the value of the coefficient in the comparison with the English Bronze Age type. Excepting this series, the coefficients based on facial characters alone are lower in every case than the corresponding ones for any of the other groups of characters. Such a result is to be expected in dealing with European series, as it is known that in comparisons between them facial measurements show far fewer significant differences, on the average, than calvarial measurements†. This difference, however, is most

* The usual 31 measurements were used, when possible, in calculating the coefficients. These are: 100 B/L, 100 H'/L, 100 B/H', 100 $G'H/GB$, 100 NB/NH', 100 O_2/O_1, R, 100 G_2/G_1, Oc. I., Alv. $P\angle$, $N\angle$, $A\angle$, 100 fmb/fml, C, L, B, H', LB, B', U, S, Q', fml, fmb, $G'H$, J, O_1R, O_2R, NH', NB, G_1 and G_2. Measurements of the same character taken in a slightly different way may sometimes be substituted for one of these, as H for H', or NH, R for NH'. Means based on fewer than 10 skulls were ignored.

† See *Biometrika*, Vol. XX[B]. 1928, pp. 335—338, and Table XVI.

TABLE IV.

Coefficients of Racial Likeness between the Spitalfields and British Series.*

		Crude Coefficients				Reduced Coefficients			
		All Characters	Indices and Angles	Calvarial Characters	Facial Characters	All Characters	Indices and Angles	Calvarial Characters	Facial Characters
Male	British Iron Age	16·73 ± ·21 (20)* [186·3, 54·7]	26·20 ± ·39 (6) [152·3, 52·0]	18·75 ± ·28 (12) [245·9, 54·6]	13·70 ± ·34 (8) [96·9, 54·9]	19·78 ± ·25	33·80 ± ·50	20·98 ± ·31	19·55 ± ·49
	Whitechapel	23·15 ± ·17 (30) [158·6, 91·0]	26·30 ± ·29 (11) [128·7, 82·6]	40·45 ± ·25 (15) [231·5, 120·2]	5·85 ± ·25 (15) [85·7, 61·7]	20·02 ± ·15	26·14 ± ·29	25·56 ± ·16	8·15 ± ·35
	Moorfields	9·75 ± ·17 (30) [169·8, 27·5]	10·47 ± ·28 (12) [152·6, 24·3]	17·22 ± ·24 (16) [242·6, 36·7]	1·22 ± ·25 (14) [86·7, 16·9]	20·60 ± ·36	24·98 ± ·67	27·01 ± ·38	4·31 ± ·88
	English Bronze Age	12·09 ± ·19 (26) [172·8, 29·6]	2·96 ± ·32 (9) [145·4, 19·6]	16·64 ± ·25 (14) [243·1, 37·7]	6·77 ± ·28 (12) [90·8, 20·0]	23·92 ± ·38	8·57 ± ·93	25·49 ± ·38	20·64 ± ·85
	Farringdon Street	30·47 ± ·17 (31) [163·9, 95·1]	36·14 ± ·28 (12) [152·1, 89·0]	46·35 ± ·24 (16) [236·7, 119·1]	13·53 ± ·25 (15) [85·7, 69·5]	25·32 ± ·14	32·18 ± ·25	29·25 ± ·15	17·63 ± ·33
	Anglo-Saxons	16·75 ± ·17 (30) [166·8, 35·5]	13·57 ± ·28 (12) [152·1, 31·4]	25·84 ± ·25 (15) [247·9, 44·7]	7·66 ± ·25 (15) [85·7, 26·2]	28·60 ± ·29	26·07 ± ·54	34·12 ± ·33	19·08 ± ·62
	British Neolithic	38·09 ± ·21 (21) [175·9, 35·3]	40·04 ± ·36 (7) [139·4, 21·3]	60·35 ± ·28 (12) [238·0, 44·1]	8·41 ± ·32 (9) [93·0, 23·6]	64·78 ± ·36	108·33 ± ·97	81·09 ± ·38	22·34 ± ·85
Female	British Iron Age	6·93 ± ·22 (18) [53·3, 27·4]	7·00 ± ·39 (6) [41·2, 25·0]	10·23 ± ·30 (10) [76·5, 30·0]	2·80 ± ·34 (8) [24·3, 24·1]	19·14 ± ·61	22·49 ± 1·25	23·74 ± ·70	11·57 ± 1·40
	Whitechapel	18·29 ± ·19 (25) [45·4, 89·1]	23·18 ± ·32 (9) [35·3, 79·7]	32·88 ± ·28 (12) [68·3, 126·0]	4·82 ± ·26 (13) [24·2, 55·0]	30·40 ± ·32	47·38 ± ·65	37·02 ± ·32	14·34 ± ·77
	Moorfields	18·60 ± ·18 (29) [51·4, 38·5]	24·87 ± ·29 (11) [48·1, 34·9]	33·85 ± ·24 (16) [73·6, 50·5]	−0·10 ± ·26 (13) [24·2, 23·7]	42·25 ± ·41	61·47 ± ·72	56·51 ± ·40	−0·42 ± 1·09
	Farringdon Street	23·26 ± ·18 (29) [50·6, 117·8]	30·72 ± ·29 (11) [48·1, 108·6]	37·94 ± ·24 (16) [72·1, 158·1]	5·27 ± ·26 (13) [24·2, 68·2]	32·85 ± ·25	46·07 ± ·43	38·31 ± ·24	14·74 ± ·73
	Anglo-Saxons	10·05 ± ·18 (28) [51·9, 31·4]	8·14 ± ·29 (11) [48·1, 29·3]	15·07 ± ·25 (15) [75·9, 36·8]	4·26 ± ·26 (13) [24·2, 25·2]	25·69 ± ·46	22·35 ± ·80	30·41 ± ·50	17·26 ± 1·05

* The Spitalfields standard deviations were used in calculating all the coefficients given in this table. The number in round brackets following the coefficient is the number of characters on which it is based. The numbers in square brackets below the coefficient are the mean numbers of skulls available for the characters used in computing it: the first is for the Spitalfields and the second for the other series in the comparison.

unusually accentuated in one case. The comparison of the Spitalfields and Moorfields female series can be made for 13 of the facial characters and a negative coefficient is found, while the corresponding male value is also low. No great importance can be attached to this result as the mean facial measurements of the Moorfields series are based on small numbers of skulls. The reduced coefficients with the Whitechapel means are also very appreciably less for facial than for calvarial characters, but this effect is less marked in the comparisons with the Farringdon Street type. Judging

TABLE V.

Reduced Coefficients of Racial Likeness between British Male Series.*

	Farringdon Street	Whitechapel	British Iron Age	Anglo-Saxons	British Neolithic	English Bronze Age
Farringdon St	—	3·83 ± ·19 (29)	4·77 ± ·31 (21)	8·79 ± ·32 (30)	18·36 ± ·42 (26)	33·10 ± ·41 (27)
Whitechapel	3·83 ± ·19 (29)	—	0·66 ± ·32† (21)	5·69 ± ·35 (28)	11·01 ± ·42 (26)	36·69 ± ·42 (27)
British Iron Age	4·77 ± ·31 (21)	0·66 ± ·32† (21)	—	4·59 ± ·49 (21)	13·06 ± ·55 (21)	39·93 ± ·60 (19)
Anglo-Saxons	8·79 ± ·32 (30)	5·69 ± ·35 (28)	4·59 ± ·49 (21)	—	8·28 ± ·58 (26)	31·94 ± ·57 (27)
British Neolithic	18·36 ± ·42 (26)	11·01 ± ·42 (26)	13·06 ± ·55 (21)	8·28 ± ·58 (26)	—	69·09 ± ·76 (27)
English Bronze Age	33·10 ± ·41 (27)	36·69 ± ·42 (27)	39·93 ± ·60 (19)	31·94 ± ·57 (27)	69·09 ± ·76 (27)	—

from all the characters, the Spitalfields type must be taken to represent a population belonging to an entirely different race from those known by the other English series as yet considered. The male reduced coefficients between six of these series used for comparative purposes, and for all available of the 31 characters, are given in Table V‡. The three seventeenth-century London and the British Iron Age

* The Farringdon Street standard deviations were used in computing all the coefficients in this table. The number in round brackets below the coefficient is the number of characters on which it is based.

† The crude coefficient between the British Iron Age and Whitechapel series is 0·44 ± ·21 and, since this does not differ significantly from zero, there is no justification for reducing it.

‡ The crude values are given in *Biometrika*, Vol. xx^{B}. 1928, pp. 310—323. The Farringdon Street standard deviations were used in computing these coefficients and slightly lower values are to be expected than if the Spitalfields constants were used. See p. 216 above.

* The Spitalfields standard deviations were used in calculating all the coefficients given in this table. The number in round brackets following the coefficient is the number of characters on which it is based. The numbers in square brackets below the coefficient are the mean numbers of skulls available for the characters used in computing it; the first is for the Spitalfields and the second for the other series in the comparison.

TABLE VI.

Mean Measurements of the Spitalfields and other British Series. Male Skulls.

	100 B/L	B	L	100 H'/L	U	S	Q'	100 NB/NH'	100 O_2/O_1, R
English Bronze Age	80·9 (42)	149·9 (89)	184·5 (48)	73·7 (24)	535·6 (81)	376·6 (62)	333·9 (7)	48·4 (15)	78·5 (13)
Spitalfields	79·4 (274)	144·1 (349)	180·7 (335)	73·7 (198)	517·0 (185)	368·5 (241)	318·9 (108)	52·0 (98)	76·9 (106)
Moorfields	75·5 (42)	143·0 (46)	189·1 (44)	68·4 (31)	527·1 (37)	378·5 (40)	305·4 (32)*	47·6 (18)†	77·3 (17)
Farringdon St	75·4 (132)	142·4 (141)	188·8 (139)	68·6 (115)	530·0 (126)	378·8 (128)	309·0 (75)	48·2 (83)	81·0 (79)
British Iron Age	74·8 (61)	141·4 (102)	187·4 (61)	70·8 (51)	528·3 (73)	379·6 (20)	—	47·0 (67)	—
Anglo-Saxons	74·7 (52)	141·7 (103)	190·6 (58)	71·2 (25)	532·0 (73)	379·8 (64)	316·1 (23)	47·5 (58)	77·9 (19)
Whitechapel	74·3 (131)	140·7 (135)	189·1 (137)	70·0 (120)	524·3 (126)	377·1 (131)	307·9 (115)*	48·3 (70)	77·7 (68)
British Neolithic	71·1 (48)	138·9 (128)	193·7 (53)	69·4 (21)	536·6 (106)	389·0 (31)	313·7 (15)	45·2 (19)	—

* These are transverse arcs measured through the bregma (Bregmatic Q') and they are probably about 1 mm. less than the vertical arcs (Q').

† This is the Frankfurt nasal index (100 NB/NH, R) and it is probably about one point greater than 100 NB/NH'.

series are all very similar to one another, one insignificant coefficient being found*. The Anglo-Saxons are more distinct, but still close to that type of which several variants are now known. The British Neolithic stands further apart and it is apparently linked on to the other series by the Anglo-Saxons. No single reduced coefficient between pairs of these six series is as large as the smallest found between them and the Spitalfields sample. Much greater divergences are indicated by the comparisons with the English Bronze Age type, and this last is nearer to the Spitalfields (Table IV) than to any other of the series yet considered (Table V).

A detailed discussion of individual measurements need not be made. By far the most significant differences found, hitherto, in the comparison with the Spitalfields series have been for $100\,B/L$, $100\,H'/L$, L, U, S and Q', while the nasal and orbital measurements have also shown some clearly significant differences. The calvarial breadth is not distinguished from that of the previously known London type. It can be seen from Table VI that when compared with other British series the Spitalfields is characterised by the peculiarly small size of its glabella-occipital length (L) and of its horizontal (U) and sagittal (S) circumferences: the capacity, and the calvaria as a whole, are most unusually small. Other salient characteristics are a high nasal and low orbital index. The cephalic index of 79·4 is close to the Bronze Age value, but much greater than all the others. No close affinity of the Spitalfields and English Bronze Age types can be postulated, however, owing to the marked difference between the sizes of their calvariae, and also on account of the marked divergences of some facial and indicial measurements (see Table IV).

It is evident that the Spitalfields is markedly different from all the better known English types. The descriptions of a number of other series from different parts of the country have been published, but these do not fulfil the minimum requirements of the biometrician, since they either deal with a small number of skulls, or give an insufficient number of measurements, or for some other reason. Comparison need only be with one of these inadequately defined series.

(*h*) F. G. Parsons: "Report on the Hythe Crania." *The Journal of the Royal Anthropological Institute*, Vol. XXXVIII. 1908, pp. 419—450. A crypt below the church of St Leonard at Hythe, Kent, is said to contain at least 4000 skeletons of men, women and children. Their age is unknown, but they probably represent the population of the town in the fourteenth and fifteenth centuries. Seven absolute measurements and two indices are given for 326 male and 230 female skulls and the re-calculated means are compared with the Spitalfields in Table VII.

The Spitalfields means are seen to be much closer to the Hythe than to those of any other series yet considered: significant differences are found, however, between the male values of $100\,H'/L$, L and B' and between the female values of $100\,B/L$, B, B' and H'. A more adequate comparison based on new, and unpublished, measurements of the Hythe skulls is made in section (9) below.

* The crude coefficients between the Moorfields and the six series in Table V are given in *Biometrika*, Vol. XVIII. 1926, pp. 24 and 100.

TABLE VII.

Mean Measurements of the Spitalfields and Hythe Series.*

	F	*L*	*B*	*B'*	*H'*	100 *B*/*L*	100 *H'*/*L*	100 *B*/*H'*
Spitalfields ♂	178·2 (318)	180·7 (335)	144·1 (349)	97·8 (316)	132·9 (215)	79·4 (274)	73·7 (198)	108·2 (192)
Hythe ♂	177·1 (324)	178·6 (319)	143·5 (324)	99·5 (318)	133·5 (306)	{80·3 (319)}	{74·7 (306)}	{107·5 (306)}
Spitalfields ♀	171·3 (113)	171·8 (119)	137·3 (113)	93·7 (139)	126·2 (54)	79·8 (89)	73·7 (47)	108·4 (44)
Hythe ♀	170·8 (230)	171·1 (227)	139·8 (230)	96·0 (227)	127·7 (222)	{81·7 (227)}	{74·6 (222)}	{109·5 (222)}

(6) *Comparisons with non-British Cranial Series.* It has been seen that no British series for which adequate measurements have been given resembles the Spitalfields at all closely. The lowest male reduced coefficient of racial likeness for all characters given above is the value of $19{\cdot}78 \pm {\cdot}25$ with the British Iron Age skulls. Unless we are dealing with an isolated type, it should be possible to find a considerable number of closer connections than this. Comparison was made with the male means of 70 European series and the coefficient was calculated in every case if the connection appeared to be at all close. When all available of the standard set of 31 characters are considered, there are only seven of these reduced coefficients with values less than nine. This comparative material was derived from the following sources:

(i) *Pompeians.* (*a*) Giustiniano Nicolucci: "Crania Pompeiana." *Atti della Reale Accademia delle Scienze Fisiche e Matematiche di Napoli*, Vol. IX. 1882. The male means of this series are given in *Biometrika*, Vol. XX[B]. 1928, pp. 370—371, and the coefficients of racial likeness between it and 40 other series are in the same paper.

(*b*) Emil Schmidt: "Die antiken Schädel Pompejis." *Archiv für Anthropologie*, Bd. XV. 1884, S. 229—257. A few of the skulls dealt with in this paper may also have been measured by Nicolucci (see Schmidt's paper, S. 230), but a comparison of the individual measurements does not suggest that there has been any duplication.

Between the male means of Nicolucci's (52·3) and Schmidt's (44·8) series a coefficient of racial likeness is found of $0{\cdot}79 \pm {\cdot}21$ for 20 characters, so the two samples may be considered to represent the same population. The pooled means are given in Table IX below.

(ii) *Etruscans.* Emil Schmidt: *Die anthropologischen Sammlungen Deutschlands.* Leipzig Catalogue (1887). Male means are given in *Biometrika*, Vol. XX[B]. 1928, pp. 370—371, and coefficients with 40 other series are in the same paper.

(iii) *Parisians.* (*a*) Paul Broca: "La race celtique ancienne et moderne." *Revue d'Anthropologie*, Tome II. 1873, pp. 577—628. On pp. 626—627 the

* The mean indices in curled brackets were found from the means of the component lengths instead of from the indices of individual skulls.

mean measurements are given of 77 male skulls from "le cimetière de l'Ouest" which was opened in 1788 and closed in 1825. The numbers on which the individual means were based are not specified, but the writer was able to ascertain these from Broca's MS. catalogues, with the kind permission of M. Papillault, and they are given in Table IX below.

(*b*) Another Parisian series known as that of "la Cité" was preserved and measured by Broca. These skulls probably represent the population of the twelfth century. A few means have been published at various times: the values in Table IX were copied from the MS. catalogues. A description of this and the previous series was given by Broca in the *Bulletins de la Société d'Anthropologie de Paris*, Tome II. 1861, pp. 501—513.

(iv) *Finns.* The male means of Finnish skulls given in Table IX were obtained by pooling the measurements of several short series. The greater number were taken from K. Hällstén's catalogues ("Matériaux pour servir à la connaissance des crânes des peuples finnois") in the *Bidrag till Kännedom af Finlands Natur och Folk, utgifna af Finska Vetenskaps-Societeten* between 1881 and 1887. The skulls in the Anatomical Museum of the University of Helsingfors were measured, in accordance with Broca's instructions, by several workers. Measurements of 41 male skulls in the same museum had previously been communicated by Gustaf Retzius ("Matériaux pour servir à la connaissance des caractères ethniques des races finnoises." *Congrès International d'Anthropologie et d'Archéologie Préhistoriques.* Compte rendu de la 7e session, Stockholm, 1874). Insufficient particulars are given, but the majority, if not all, of these are skulls of criminals, and none of them was included, apparently, in Hällstén's catalogues. A few measurements of 31 male Finnish skulls in the Anatomical Museum of the Caroline Institute at Stockholm were also provided by Retzius in the *Finska Kranier* (Stockholm, 1878, S. 176—177 and 191—198) and there are 14 male specimens described in the München, Heidelberg, Strassburg and Leipzig sections of *Die anthropologischen Sammlungen Deutschlands*, Flower's catalogue and a paper by Rudolf Virchow (*Archiv für Anthropologie*, Bd. IV. 1870, S. 89). Between all the male skulls in Hällstén's catalogues on the one hand (72·4) and all others from the sources given above (53·7) a coefficient is found of 2·17 ± ·21 for 20 characters and the reduced value is 3·52 ± ·35. The last is less than the reduced coefficient between the Whitechapel and Farringdon Street English series (see Table V above). It would probably be possible to distinguish a more homogeneous group of Finnish skulls by considering different areas of the country as a whole and different time periods, but the material available at present is barely sufficient for such purposes. The majority of the specimens can be assigned to the eighteenth and nineteenth centuries. The male means obtained by pooling all the above series are in Table IX.

(v) *Austrians* (*Vienna*). A. Weisbach: "Beiträge zur Kenntniss der Schädelformen österreichischer Völker nebst Bemerkungen über einige Veränderungen des deutschen Männer- und Weiberschädels im Alter zwischen 20 und 80 Jahren." *Zeitschrift der k.k. Gesellschaft der Ärzte in Wien, Medizinische Jahrbücher*, XX

Jahrgang 1864, Heft I. S. 49—127, Heft IV. S. 33—86 and S. 119—154. Male means of this modern series are given in our Table IX.

(vi) *Great Russians.* A. Tarenetzky: "Beiträge zur Craniologie der grossrussischen Bevölkerung der nördlichen und mittleren Gouvernements des europäischen Russlands." *Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg,* vii^e^ série, Tome XXXII. 1884, pp. 1—81. Means are given in *Biometrika,* Vol. XX^B^. 1928, pp. 374—375, and coefficients with 40 other series are in the same paper.

A direct comparison of the mean measurements, of which the majority are given in Table IX, is sufficient to bring the conviction that each of these seven series bears a much closer resemblance to the Spitalfields type than any previously measured British series does. Coefficients of racial likeness are given in Table VIII. The reduced coefficient of 3·54 ± 17 with the Pompeians indicates a degree of relationship which is as close as one normally found between two neighbouring and contemporary groups. It is of the same order as that between the Whitechapel and Farringdon Street series (see Table V) which both represent the seventeenth-century population of London. When compared with European types in general, the Spitalfields no longer possesses that isolated character which was suggested by the comparison with British types. All the reduced coefficients between six of the seven foreign series in Table VIII are given in Table X, and the scheme of relationship which they suggest can be appreciated from the diagram (Fig. VI). The highest reduced coefficient in Table X is 8·57. The Great Russians have been omitted from this table because they have no reduced coefficients with the other foreign series considered less than 9. Little significance need be attached to the value of 7·70 found with the Spitalfields series. The Great Russians have a number of far closer connections with Eastern European types. The case of the six remaining foreign series is quite different. They are all intimately connected with one another. In the comparison with all the available European data the Pompeians have no lower reduced coefficient than that of 2·44 with the Austrians from Vienna, and the value of 3·55 between the Finns and Etruscans is the lowest found for either of these series. The Spitalfields is clearly entitled to be considered a member of this group of closely allied racial types. The fact that it bears a closer resemblance to the Pompeians and Etruscans than to any other series suggests that this London population was Italian in origin. The Parisians are rather further removed, and it is less likely that a type from the north of France is represented. It is curious that the Viennese type is closely connected with one Parisian series but not with the other, and also closely connected with the Pompeians but not with the Etruscans. The fact that the Etruscans and Finns bear a closer resemblance to one another than to any other available types is again unexpected as the two are generally supposed to have little in common except the fact that their relationships are more conjectural than those of most other European races. It is curious to find this close association of racial types from such widely scattered regions, and particularly the association of the Finns with the other races. The cephalic indices of the seven foreign series considered in Table VIII range from 78·6 to 81·2, while the Spitalfields value is

TABLE VIII.

Coefficients of Racial Likeness between the Spitalfields and non-British Male Series.*

	Crude Coefficients				Reduced Coefficients			
	All Characters	Indices and Angles	Calvarial Characters	Facial Characters	All Characters	Indices and Angles	Calvarial Characters	Facial Characters
Pompeians (Schmidt & Nicolucci)	4·10 ± ·20 (23) [177·1, 86·2]	7·30 ± ·34 (8) [148·5, 83·9]	2·77 ± ·26 (13) [246·3, 96·0]	5·84 ± ·30 (10) [87·1, 73·4]	3·54 ± ·17	6·81 ± ·32	1·95 ± ·18	7·33 ± ·38
Etruscans (Schmidt)	4·27 ± ·18 (29) [153·5, 80·6]	3·90 ± ·30 (10) [127·5, 79·5]	4·55 ± ·25 (15) [225·2, 81·7]	3·96 ± ·25 (14) [76·7, 79·5]	4·04 ± ·17	3·97 ± ·31	3·79 ± ·21	5·07 ± ·32
Parisians: Cité (Broca)	3·61 ± ·20 (22) [186·1, 54·6]	5·11 ± ·39 (6) [170·5, 57·2]	2·79 ± ·25 (14) [243·2, 64·9]	5·04 ± ·34 (8) [86·1, 41·3]	4·28 ± ·24	5·97 ± ·46	2·72 ± ·24	9·03 ± ·61
Finns (Hällstén and others)	7·55 ± ·19 (24) [175·7, 113·8]	4·55 ± ·39 (6) [171·7, 116·0]	4·92 ± ·25 (15) [231·6, 126·9]	11·93 ± ·32 (9) [82·6, 91·3]	5·47 ± ·14	3·29 ± ·28	3·00 ± ·15	13·75 ± ·37
Austrians: Vienna (Weisbach)	5·80 ± ·20 (22) [186·1, 49·6]	7·41 ± ·32 (9) [172·8, 49·6]	6·10 ± ·25 (14) [249·6, 49·9]	5·58 ± ·34 (8) [75·0, 49·3]	7·41 ± ·26	9·61 ± ·42	7·33 ± ·30	9·38 ± ·57
Great Russians (Tarenetzky)	13·05 ± ·21 (20) [183·9, 157·0]	17·13 ± ·39 (6) [170·3, 157·0]	8·95 ± ·26 (13) [237·3, 157·0]	20·69 ± ·36 (7) [84·9, 156·9]	7·70 ± ·12	10·48 ± ·24	4·74 ± ·14	18·78 ± ·33
Parisians: L'Ouest (Broca)	9·37 ± ·21 (20) [190·6, 76·7]	12·92 ± ·39 (6) [170·5, 76·7]	4·95 ± ·26 (13) [247·5, 77·3]	17·59 ± ·36 (7) [85·0, 75·6]	8·57 ± ·19	12·21 ± ·37	4·20 ± ·22	21·98 ± ·45

* The Farringdon Street standard deviations were used in calculating all the coefficients in this table. The number in round brackets following the coefficient is the number of characters on which it is based. The numbers in square brackets below the coefficient are the mean numbers of skulls available for the characters used in computing it: the first mean is for the Spitalfields and the second for the other series in the comparison.

TABLE IX. *Mean Measurements of the Spitalfields and closely allied Male Series*.*

	Spitalfields	Pompeians (Schmidt and Nicolucci)	Parisians: Cité (Broca)	Parisians: L'Ouest (Broca)	Finns (Hällstén, Retzius & others)	Austrians: Wien (Weisbach)
C†	1415·7 (68)	1503·6 (51)	1531·9 (67)	1558·4 (77)	1537·0 (119)	1521·6 (49)
L	180·7 (335)	181·0 (100)	182·4 (69)	182·7 (77)	181·5 (157)	180·3 (50)
B	144·1 (349)	143·1 (100)	144·3 (69)	145·2 (77)	144·8 (155)	146·8 (50)
H'	132·9 (215)	130·4 (95)	132·2 (63)	132·0 (77)	134·4 (118)	131·3 (50)
H	132·5 (110)	—	—	—	129·7 (10)	—
IOW	98·0 (264)	—	95·6 (44)	—	—	—
EOW‡	—	—	104·4 (44)	—	—	—
B'	97·8 (316)	97·9 (100)	97·2 (69)	100·0 (78)	98·1 (143)	96·1 (50)
B''	123·0 (237)	121·0 (45)	—	—	—	—
LB	100·5 (188)	99·3 (96)	97·5 (61)	—	100·9 (143)	98·9 (50)
Biasterionic *B*	111·1 (230)	110·4 (45)	—	—	—	112·1 (50)
S_1	127·3 (352)	125·5 (52)	128·4 (66)	129·0 (77)	129·5 (128)	127·5 (50)
S_2	124·4 (429)	124·1 (52)	127·9 (66)	126·3 (77)	128·1 (124)	127·0 (50)
S_3	115·9 (410)	115·9 (50)	118·5 (65)	119·5 (77)	115·0 (124)	117·0 (50)
S	368·5 (241)	367·3 (96)	{374·8 (65)}	{374·8 (77)}	373·4 (144)	371·5 (50)
Q'	318·9 (108)	—	—	—	310·8 (10)	—
Broca's *Q'*	308·2 (203)	—	306·6 (66)	312·4 (77)	313·9 (77)	—
U	517·0 (185)	519·2 (99)	520·0 (66)	525·6 (77)	520·4 (85)	—
Glabella *U*‡	—	—	—	—	526·4 (57)	521·8 (50)
S_3'	95·9 (413)	94·9 (45)	—	—	—	94·0 (50)
fml	35·0 (255)	35·0 (92)	34·6 (62)	35·2 (78)	35·8 (126)	36·0 (50)
fmb	29·6 (227)	29·8 (90)	29·7 (62)	30·0 (78)	30·3 (125)	30·2 (50)
G'H	69·2 (95)	70·1 (99)	67·8 (27)	—	69·4 (64)	71·7 (49)
GL	95·3 (80)	93·8 (95)	—	—	97·9 (7)	94·2 (49)
J	131·9 (85)	131·7 (45)	130·3 (44)	133·0 (76)	134·8 (125)	132·3 (50)
GB	93·7 (85)	—	—	—	98·7 (6)	92·5 (49)
O_1, *R* or *L*	42·5 (109) *R*	—	—	—	—	—
O_1', *R* or *L*	40·4 (41) *R*	39·8 (55)	—	—	38·7 (113)	39·7 (50)
Lacry. O_1, *R* or *L*	39·1 (33) *R*	37·8 (45)	40·1 (43)	39·65 (75)	37·4 (9)	—
O_2, *R* or *L*	32·6 (124) *R*	33·7 (100)	32·9 (43)	34·0 (75)	32·4 (125)	33·8 (49)
NH, *R* or *L*	50·0 (115) *R*	51·3 (45)	—	—	51·0 (10)	—
NH'	48·3 (107)	52·2 (55)	49·6 (44)	51·4 (76)	50·6 (76)	—
NB	24·9 (114)	23·9 (100)	23·9 (43)	24·1 (76)	24·4 (124)	—
SC	9·7 (128)	—	10·1 (43)	—	—	—
Broca's G_1‡	—	—	48·4 (42)	—	50·1 (107)	—
Broca's G_2‡	—	—	37·2 (43)	—	37·7 (70)	—
PH‡	—	—	19·5 (44)	—	18·9 (40)	—
100 *B*/*L*	79·4 (274)	79·2 (100)	79·1 (69)	79·5 (77)	79·8 (150)	{81·2 (50)}
100 *H'*/*L*	73·7 (198)	{72·0 (95)}	72·4 (63)	72·3 (77)	{74·0 (118)}	{72·6 (50)}
100 *H*/*L*	73·5 (109)	—	—	—	71·2 (6)	—
100 *B*/*H'*	108·2 (192)	{109·7 (95)}	{109·2 (63)}	{110·0 (77)}	{107·7 (118)}	{111·8 (50)}
100 *B*/*H*	108·4 (102)	—	—	—	110·7 (10)	—
100 *G'H*/*GB*	74·3 (62)	—	—	—	68·9 (6)	{77·5 (49)}
Oc. I.	59·8 (402)	—	—	—	—	58·4 (50)
100 *fmb*/*fml*	84·5 (227)	{85·1 (90)}	86·0 (62)	84·9 (78)	{84·6 (125)}	{83·9 (50)}
100 O_2/O_1	76·9 (106) *R*	—	—	—	—	—
100 O_2/O_1'	79·8 (41) *R*	85·2 (55)	—	—	{83·7 (113)}	{85·1 (49)}
100 O_2/Lacry. O_1	82·0 (33) *R*	87·8 (45)	82·1 (43)	85·7 (75)	86·5 (9)	—
100 *NB*/*NH*	50·0 (104) *R*	46·3 (45)	—	—	47·2 (10)	—
100 *NB*/*NH'*	52·0 (98)	46·0 (55)	48·1 (43)	46·9 (76)	49·0 (72)	—
100 Broca's G_2/G_1	—	—	{76·9 (42)}	—	74·5 (67)	—
NL	65°·4 (76)	{64°·5 (95)}	—	—	65°·8 (6)	{64°·6 (49)}
AL	73°·6 (76)	{73°·0 (95)}	—	—	70°·8 (6)	{72°·1 (49)}
BL	41°·0 (76)	{42°·5 (95)}	—	—	43°·4 (6)	{43°·3 (49)}

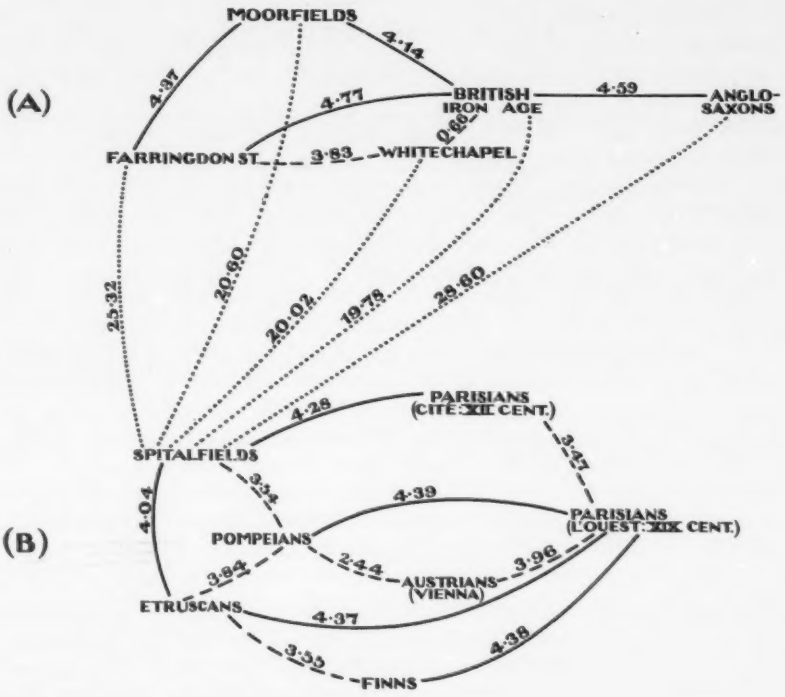
* Mean indices, angles and median sagittal arcs (*S*) in curled brackets were found from the means of the component lengths instead of from individual values.

† The capacities were determined by different methods and they were not used in computing the coefficients of racial likeness. If the Spitalfields mean may be supposed correct, then all others in the table are probably too large.

‡ The following measurements are not defined in Appendix I: *EOW* = "biorbitaire externe. Le plus grand écartement des deux apophyses orbitaires externes sur leur bord externe" (Broca). Glabella *U* = maximum horizontal circumference passing through the glabella. Broca's G_1 = chord from the tip of the posterior nasal spine to a point "derrière les incisives médianes, sur la lèvre postérieure du bord alvéolaire." Broca's G_2 = "le maximum d'écartement de la courbe intérieure de l'arcade alvéolaire." *PH* = "de l'épine nasale au point alvéolaire" (Broca).

FIG. VI. THE RELATIONSHIPS OF:
(A) SEVENTEENTH CENTURY LONDON AND OTHER BRITISH TYPES.
(B) TYPES CLOSELY RELATED TO THE SPITALFIELDS TYPE.

REDUCED COEFFICIENTS OF RACIAL LIKENESS { LESS THAN 4, - - - -
4 – 5, ———
19 – 29, ·····



N.B. THE REDUCED COEFFICIENTS BETWEEN THE SERIES OTHER THAN THE SPITALFIELDS IN GROUP B AND THE SERIES IN GROUP A HAVE NOT BEEN CALCULATED, BUT THEY ARE PROBABLY ALL OF THE ORDER 20–30.

79·4. It may be seen from the same table that the reduced coefficients for calvarial characters only are lower in all cases, and markedly lower in most, than the reduced coefficients for facial characters only. It is unusual to find such a relation in the case of closely allied types, and the very opposite condition was found in the comparison of the Spitalfields with British series.

(7) *A Comparison of Single Measurements.* It has been shown that the Spitalfields type is distinguished from almost all the other known British types on account of the small size of its calvaria, its high cephalic, height-length and nasal

TABLE X.

Reduced Coefficients of Racial Likeness between Male Series closely related to the Spitalfields Series.

	Spitalfields	Pompeians	Etruscans	Parisians: Cité	Finns	Austrians: Wien	Parisians: L'Ouest
Spitalfields	—	3·54 ± ·17 (23)	4·04 ± ·17 (29)	4·28 ± ·24 (22)	5·47 ± ·14 (24)	7·41 ± ·26 (22)	8·57 ± ·19 (20)
Pompeians	3·54 ± ·17 (23)	—	3·84 ± ·24 (23)	6·88 ± ·31 (21)	6·91 ± ·21 (21)	2·44 ± ·34 (19)	4·39 ± ·27 (19)
Etruscans	4·04 ± ·17 (29)	3·84 ± ·24 (23)	—	5·28 ± ·32 (21)	3·55 ± ·21 (22)	5·94 ± ·36 (19)	4·37 ± ·28 (19)
Parisians: Cité	4·28 ± ·24 (22)	6·88 ± ·31 (21)	5·28 ± ·32 (21)	—	6·19 ± ·27 (23)	5·87 ± ·46 (15)	3·47 ± ·32 (20)
Finns	5·47 ± ·14 (24)	6·91 ± ·21 (21)	3·55 ± ·21 (22)	6·19 ± ·27 (23)	—	7·02 ± ·31 (19)	4·38 ± ·23 (18)
Austrians: Wien	7·41 ± ·26 (22)	2·44 ± ·34 (19)	5·94 ± ·36 (19)	5·87 ± ·46 (15)	7·02 ± ·31 (19)	—	3·96 ± ·43 (13)
Parisians: L'Ouest	8·57 ± ·19 (20)	4·39 ± ·27 (19)	4·37 ± ·28 (19)	3·47 ± ·32 (20)	4·38 ± ·23 (18)	3·96 ± ·43 (13)	—

indices and low orbital index. A comparison with European races in general shows that it has very few characters which are quite extreme for that population. No calvarial index is at all distinctive. The brain-box as a whole is small, but its principal size measurements such as the capacity, median sagittal (*S*) and horizontal (*U*) arcs are all greater than some others that have been recorded. The foraminal measurements are also unusually small, but still not extreme. The bizygomatic (*J*) and bimaxillary (*GB*) breadths are of an average size for a European type, the nasal and orbital breadths are distinctly large and only one larger male palatal breadth (G_2) than 41·6 seems to have been recorded for a European race which is a mean of 42·6 for 28 mediaeval Magyar skulls*. On the other hand, the orbital and nasio-alveolar heights are rather small and the nasal height (*NH'*) of 48·3 is quite extreme as no other male mean less than 49·0 can be found for a European series. Little can be said of the palatal height (*EH*) and of the dacryal and simotic measurements, since the comparative material is very inadequate, but the palate of

* L. Bartucz: "Altungarische Schädel." *Ethnographische Sammlungen des ung. Nationalmuseums*, v. 1916.

the Spitalfields type is relatively shallower (judging by the index 100 EH/G_3) and its nasal bridge is flatter (judging by the index 100 DS/DC) than for the Farringdon Street and Whitechapel English, Anglo-Saxons or Basques. The orbital index appears to have the distinction of being as low as any other recorded for a modern race from Europe or North Africa. On the right side 100 O_2/O_1 is 76·9 (106) and on the left 77·8 (120), while the only other male indices below 79 observed are for Predynastic Egyptians (Naqada *A* and *Q*)* 77·4, English (Moorfields)† 77·4, English (Whitechapel)‡ 77·7, East German Neolithic§ 78·1, 1st Dynasty Egyptians‖ 78·2, Anglo-Saxons¶ 78·3 and Reihengräber** 78·3. The brachycephalic races of Europe all have orbital indices greater than 80. It is curious that the Spitalfields type should be associated in this way with the dolichocephalic ones of Western Europe. The nasal index (100 NB/NH') is slightly higher than any other which can be found for a European race, and the palatal index is also extremely high. The profile angle is rather smaller—indicating a greater degree of prognathism—than any other European value, while the nasal angle, though large, is exceeded by several other means. The features which most clearly distinguish the Spitalfields from neighbouring types are all facial. It may be seen from Table VIII that when comparison is made with the series which most closely resemble the present one when all characters are considered, the coefficient of racial likeness for facial characters only is in every case larger, and in most very appreciably larger, than the coefficient for calvarial characters only. It is quite unusual to find such a relation as the contributions of the calvarial characters to the coefficient—the α's—are, on the average, much greater than the contributions of the facial characters for comparisons between European racial types††. In the comparison with the Pompeians the only significant differences ($\alpha > 10$) are for 100 NB/NH ($\alpha = 22{\cdot}39$), 100 H'/L (17·65), 100 O_2/O_1' (16·70), H' (16·08) and NB (13·73); with the Etruscans the significant differences are 100 NB/NH (22·97), fmb (17·13), S (15·16), NH (12·77) and U (10·02), and with the Parisians (Cité) 100 NB/NH' (23·67), LB (20·73) and S (10·09). The nasal index shows a more significant difference than any other character in these three cases, and it is evidently the peculiarity of this measurement for the Spitalfields series which has rendered it impossible to find any very close similarity between the present and any other type. The comparison between the Spitalfields and British series is made in Table IV, and in this case the coefficients for facial characters alone are all *less*, and in many cases very appreciably less, than for calvarial characters alone. This reduction is most striking in the case of the Moorfields series, the coefficient of $4{\cdot}31 \pm {\cdot}88$ for facial characters being the lowest male value found with the Spitalfields facial measurements, and the female coefficient being insignificant. Still confining our attention to the same

* *Biometrika*, Vol. XVII. 1925, p. 15.
† Ref. (*b*) on p. 223 above.
‡ Ref. (*a*) on p. 222 above.
§ *Archiv für Anthropologie*, Bd. XXXV. 1908, S. 232—237.
‖ *Biometrika*, Vol. XVII. 1925, p. 24.
¶ Ref. (*g*) on p. 223 above.
** *Biometrika*, Vol. XX^B. 1928, p. 373.
†† See *Biometrika*, Vol. XX^B. 1928, pp. 335—338.

group of characters, the Spitalfields type is seen to resemble the Whitechapel more closely than either Parisian type. There is no reason to doubt that the best measure of resemblance is the one which takes account of all the more important regions of the skull, and it is unusual to find that the results reached in that way are so markedly different from the ones arrived at when comparisons are restricted

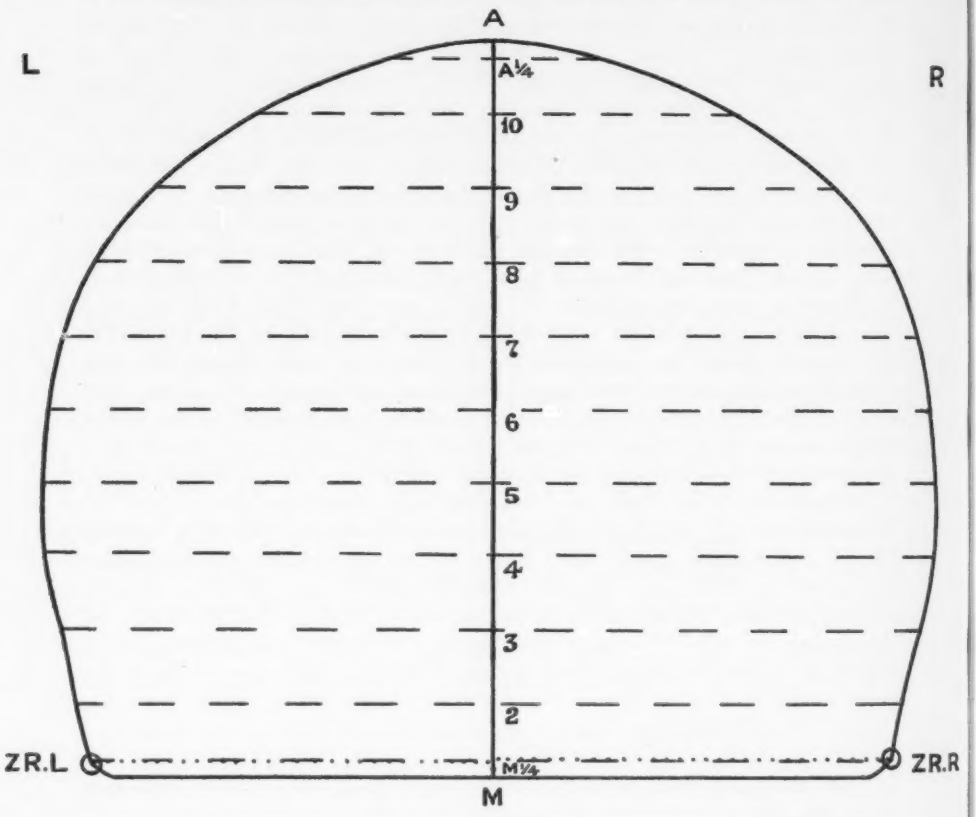


FIG. VII. Spitalfields ♂ Vertical Type Contour (121 Crania)

to a particular class of characters. The comparative material appears to be insufficient to decide at all definitely any questions concerning the origin of this form of skull which is especially characterised by its facial characters and, in particular, by its high nasal and low orbital indices.

(8) *Type Contours.* The male and female type contours for the Spitalfields

series were constructed in the way invariably employed in the Biometric Laboratory*. The mean measurements of the individual contours are in Tables XI—XIII and the types constructed from these are Figs. VII—XII.

There is a very satisfactory agreement between a number of mean absolute measurements and measurements of the type contours which correspond to them.

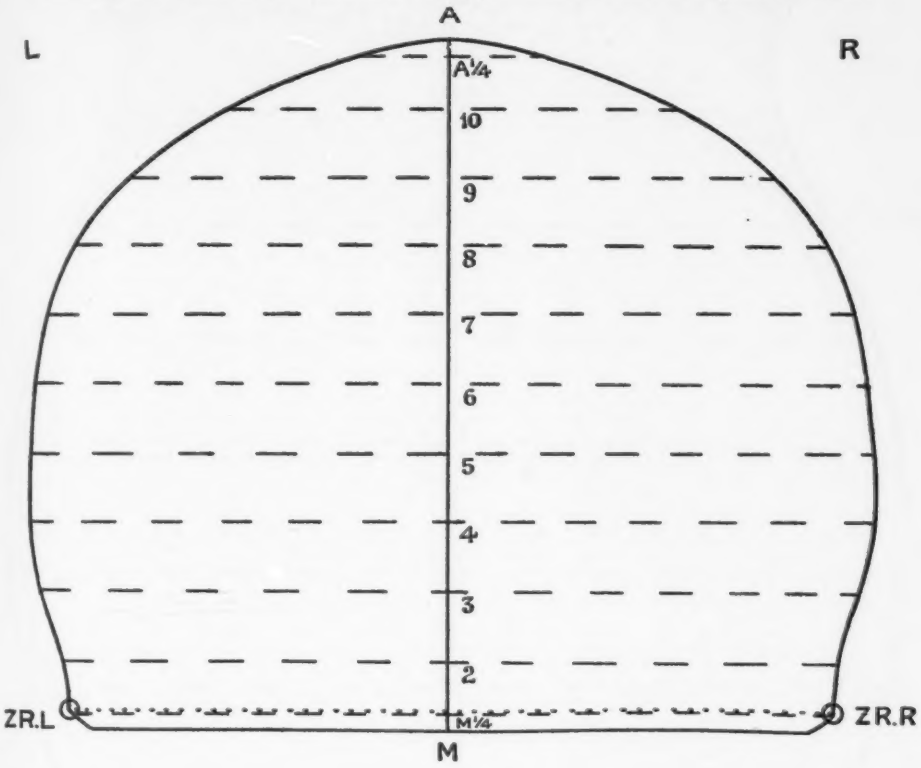


FIG. VIII. Spitalfields ♀ Vertical Type Contour (24 Crania)

In the case of the male series no differences of the angular measurements exceed 1° and the only differences between lengths which are greater than 1 mm. are for

* See *Biometrika*, Vol. XIV. 1923, pp. 227—244. The methods of construction described here were followed exactly except in the case of the nasal measurements of the sagittal contour. The nasal measurements (i), (ii) and (iii) in Table XIII were found by dropping a perpendicular from the nasion and measuring from it to the outline along lines which are parallel to the $N\gamma$ line and at distances $\frac{1}{10}$th, $\frac{2}{10}$ths and $\frac{3}{10}$ths of $N\gamma$ from that base line. In this way use can be made of the outline of the nasal bones when their tip is defective, as it generally is.

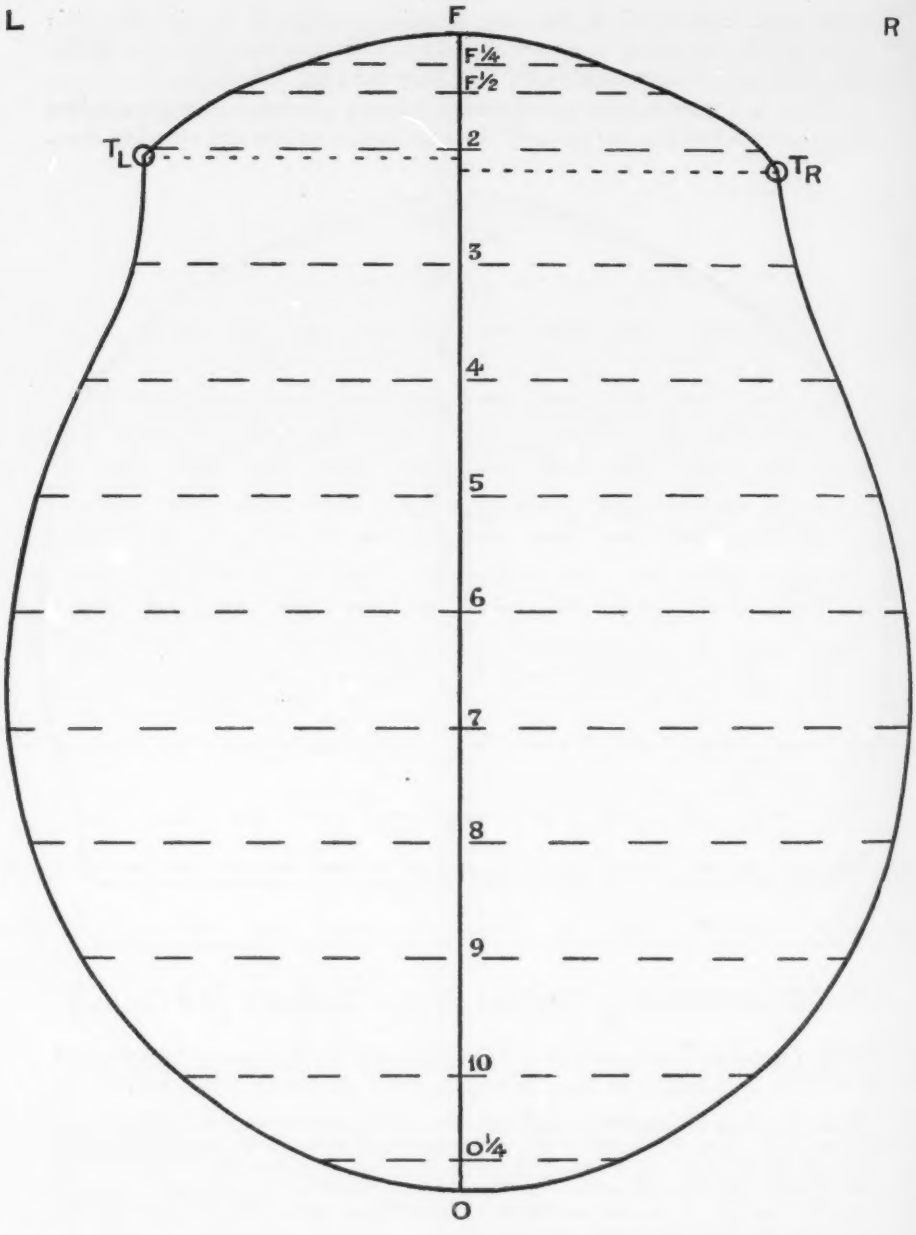


FIG. IX. Spitalfields ♂ Horizontal Type Contour (122 Crania)

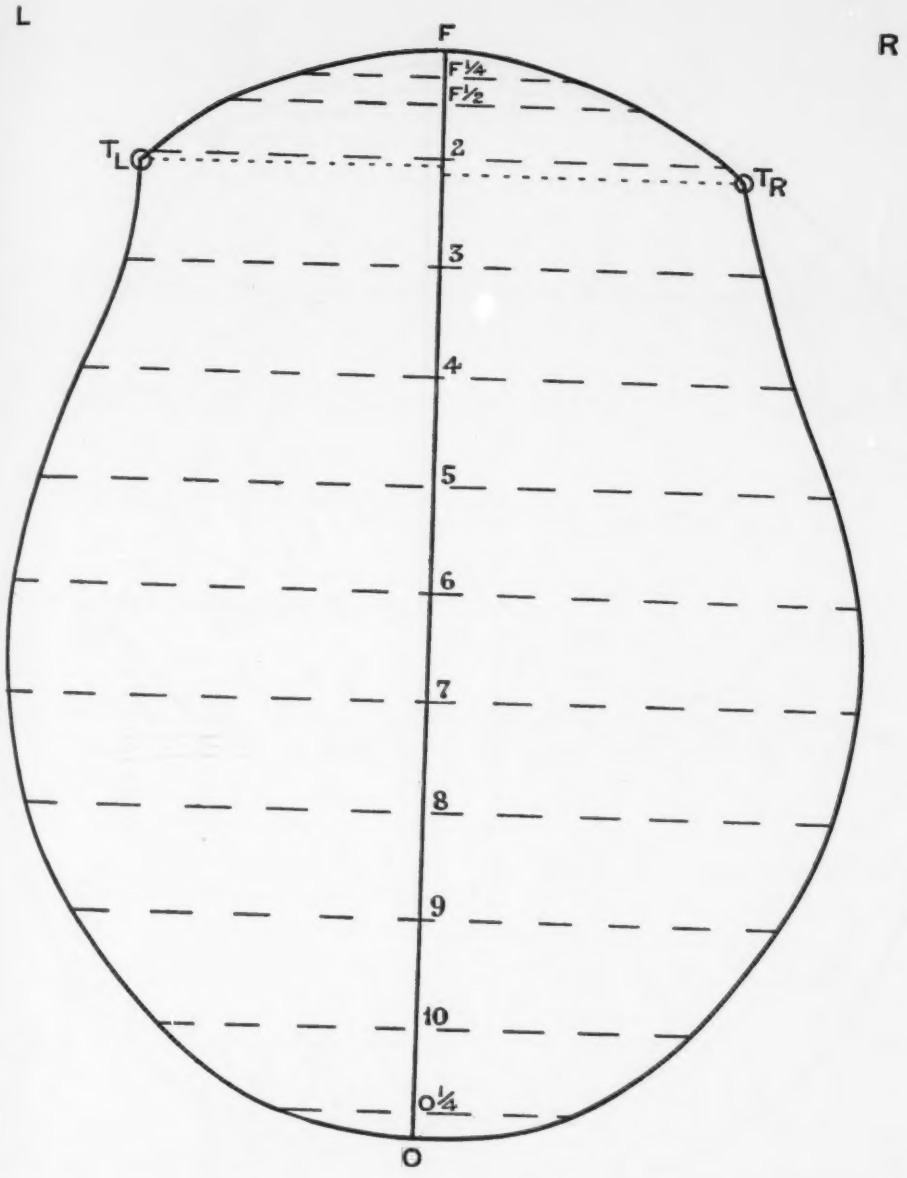


FIG. X. Spitalfields ♀ Horizontal Type Contour (23 Crania)

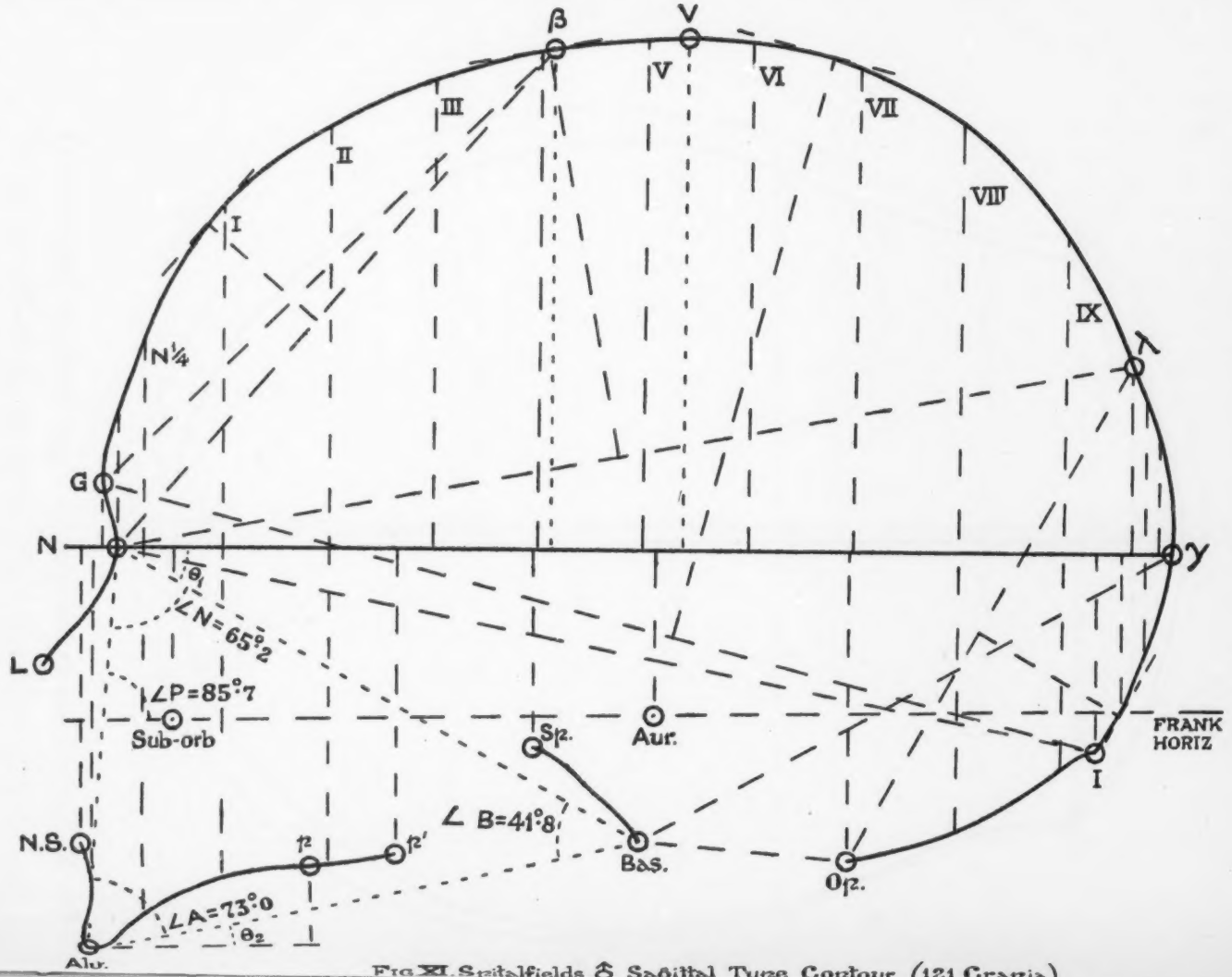


FIG XI Spitalfields ♂ Sagittal Type Contour (121 Crania)

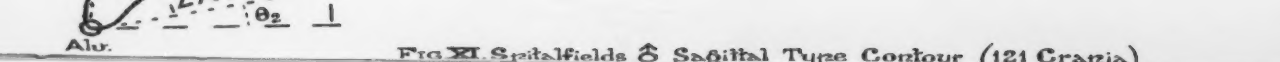


Fig. XI. Spitalfields ♂ Sagittal Type Contour (121 Crania)

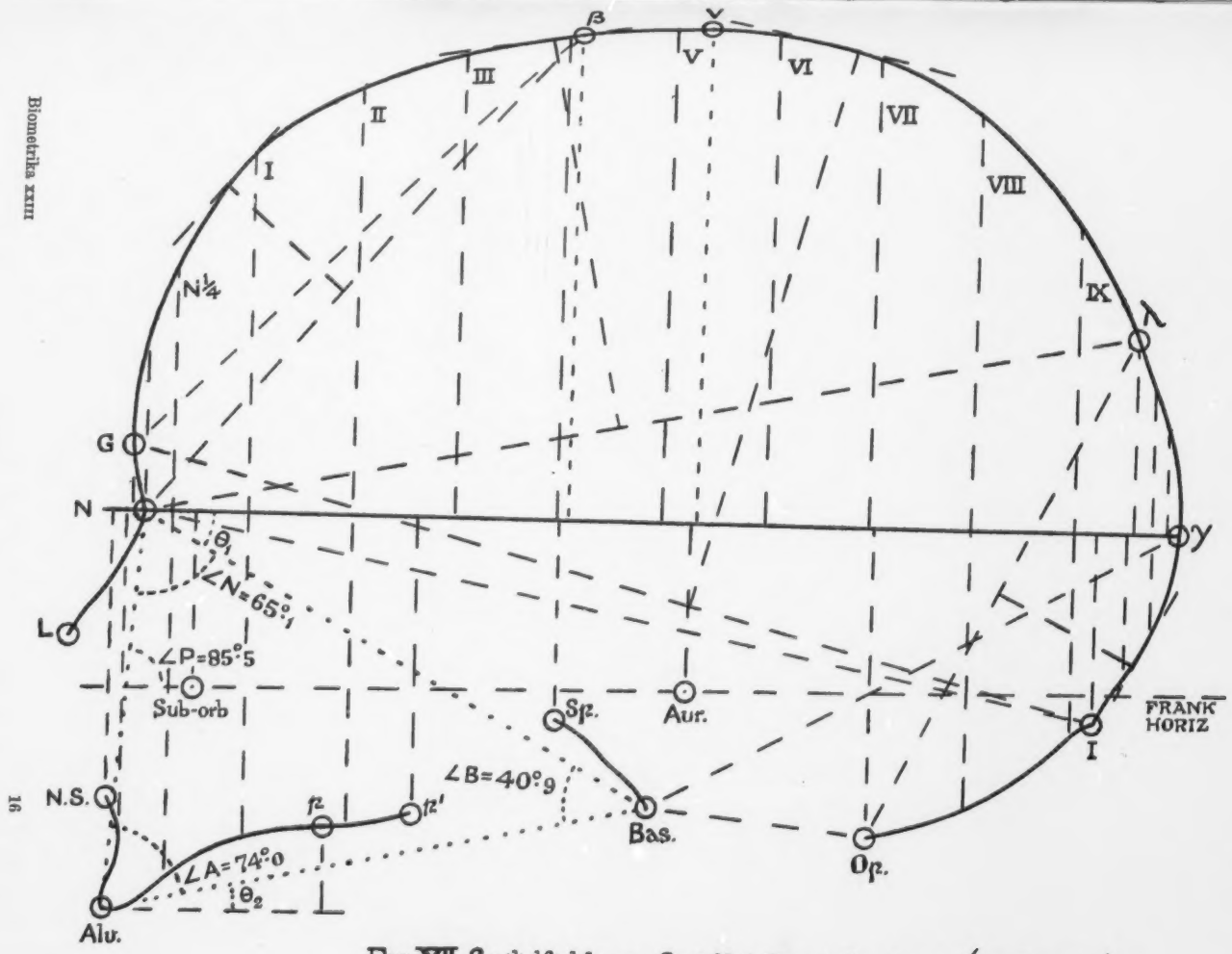


Fig. XII. Spitalfields ♀ Sagittal Type Contour (23 Crania)

TABLE XI.

Spitalfields Transverse Vertical Contours. Mean Values.

	MA	1*R*=1*L*	*M*½*R*	*M*½*L*	2*R*	2*L*	3*R*	3*L*	4*R*	4*L*	5*R*	5*L*	6*R*	6*L*
♂	114·7 (121)	58·9 (121)	62·4 (121)	61·8 (121)	64·4 (120)	64·7 (121)	67·7 (117)	67·1 (119)	70·4 (117)	69·8 (115)	70·6 (116)	70·0 (115)	69·6 (116)	69·1 (114)
♀	108·5 (24)	55·8 (24)	58·9 (24)	58·8 (24)	60·6 (24)	60·3 (24)	63·6 (22)	64·2 (23)	66·2 (21)	65·9 (23)	66·1 (21)	65·7 (24)	65·0 (21)	64·9 (24)

	7*R*	7*L*	8*R*	8*L*	9*R*	9*L*	10*R*	10*L*	*A*½*R*	*A*½*L*	*ZR, R*		*ZR, L*	
											x	*y*	*x*	*y*
♂	67·1 (118)	66·9 (117)	62·5 (119)	62·0 (116)	53·4 (121)	52·6 (118)	37·8 (121)	36·8 (117)	16·3 (121)	16·3 (118)	2·9 (121)	62·6 (121)	2·8 (121)	62·2 (121)
♀	63·0 (20)	62·9 (24)	58·9 (21)	58·4 (24)	50·8 (22)	49·7 (22)	35·6 (23)	34·7 (21)	14·6 (23)	14·6 (23)	3·0 (24)	59·4 (24)	3·0 (24)	59·1 (24)

TABLE XII.

Spitalfields Horizontal Contours. Mean Values.

	FO	*F*½*R*	*F*½*L*	*F*½*R*	*F*½*L*	2*R*	2*L*	3*R*	3*L*	4*R*	4*L*	5*R*	5*L*	6*R*	6*L*
♂	180·1 (122)	21·5 (119)	23·9 (120)	32·6 (120)	35·5 (118)	47·0 (120)	47·9 (119)	52·3 (119)	50·8 (114)	59·2 (118)	58·5 (110)	66·3 (117)	65·8 (115)	70·8 (116)	69·6 (115)
♀	169·7 (23)	20·0 (23)	22·1 (23)	30·9 (23)	33·9 (23)	44·4 (22)	45·3 (23)	50·6 (22)	49·0 (23)	55·7 (21)	55·5 (22)	62·3 (21)	61·7 (22)	66·7 (20)	65·5 (22)

	7*R*	7*L*	8*R*	8*L*	9*R*	9*L*	10*R*	10*L*	*O*½*R*	*O*½*L*	*T*(*R*) *x*	*T*(*L*) *x*	*T*(*R*) *y*	*T*(*L*) *y*
♂	71·7 (115)	70·2 (116)	68·4 (118)	66·9 (120)	60·2 (118)	58·7 (121)	45·8 (118)	43·3 (121)	25·5 (121)	22·7 (122)	21·0 (120)	19·1 (119)	49·5 (120)	49·3 (119)
♀	67·1 (21)	65·9 (22)	63·6 (21)	62·4 (23)	55·6 (22)	54·2 (23)	42·6 (22)	40·3 (23)	24·8 (23)	22·0 (23)	19·4 (22)	17·8 (23)	47·1 (22)	47·2 (23)

H′ (absolute 132·9 ± ·25 (215), contour 134·3 (112)) and *H* (absolute 132·5 ± ·33 (110), contour 134·9 (112)). The divergences in these cases may be partly due to the fact that the corresponding means are based on different numbers of individuals. A number of angular and indicial measurements have been devised with the purpose of comparing the most important racial features of these three sections. The ranges for all the most reliable type contours previously published have been given*, and

* See *Annals of Eugenics*, Vol. IV. 1930, pp. 148—151.

TABLE XIII. *Spitalfields Sagittal Contours*

TABLE XIII.

Spitalfields Sagittal Contours. Mean Values.

	$N\gamma$	Ordinates above $N\gamma$												
		$O=N$	$N\frac{1}{4}$	1	2	3	4	5	6	7	8	9	$\gamma\frac{1}{4}$	$\gamma\frac{1}{2}$
♂	177·6 (121)	22·0 (119)	35·6 (117)	58·1 (119)	71·2 (118)	79·2 (118)	84·1 (120)	85·8 (117)	85·5 (118)	81·9 (118)	72·5 (117)	53·2 (118)	26·1 (120)	19·1 (120)
♀	167·5 (23)	28·3 (20)	39·1 (22)	58·5 (22)	69·3 (21)	75·8 (21)	79·8 (20)	81·3 (20)	81·1 (19)	76·7 (21)	67·3 (23)	49·4 (23)	24·0 (23)	17·6 (23)

	Ordinates below $N\gamma$							Vertex		β		Glabella	
	$N\frac{1}{4}$	1	2	3	9	$\gamma\frac{1}{2}$	$\gamma\frac{1}{4}$	x from N	y	x from N	y	x from N	y
♂	62·7 (97)	56·0 (95)	53·6 (83)	47·0 (120)	36·4 (120)	26·5 (121)	17·1 (121)	95·1 (117)	86·5 (117)	72·8 (120)	84·4 (120)	2·7 (121)	10·4 (121)
♀	59·1 (19)	52·4 (19)	50·5 (16)	45·1 (23)	33·2 (23)	23·6 (23)	16·3 (23)	89·3 (19)	82·0 (19)	68·4 (20)	80·1 (20)	1·7 (23)	10·8 (23)

	Occipital Pt.		λ		Sub-Orb.		Aur. Pt.		Opisthion		Inion		Basion	
	x from γ	y	x from γ	y	x from N	y	x from γ	y	x from γ	y	x from γ	y	from γ	from N
♂	0·5 (121)*	3·2 (121)	6·9 (120)	31·7 (120)	9·2 (121)	28·9 (121)	90·7 (121)	27·7 (121)	53·8 (116)	52·1 (116)	12·6 (120)	33·3 (120)	101·7 (112)	100·7 (112)
♀	0·4 (23)*	3·2 (23)	7·2 (23)	31·6 (23)	8·5 (23)	28·3 (23)	88·2 (23)	27·0 (23)	49·5 (23)	50·2 (23)	13·3 (23)	30·8 (23)	96·1 (22)	94·8 (22)

	Alv. Pt.		Nose					Palate				Frontal	
								P'		P		Max. Sub. to $N\beta$	
	from N	from Bas.	(i)	(ii)	(iii)	$\angle LN\gamma$	NL	x from N	y	x from Alv.	y	x from N	y
♂	70·1 (76)	95·6 (71)	1·1 (104)	3·5 (100)	7·1 (88)	121°·3 (13)	23·4 (13)	47·2 (75)	51·5 (75)	36·8 (63)	15·0 (63)	50·6 (118)	24·6 (118)
♀	64·4 (19)	89·7 (18)	1·0 (18)	3·5 (18)	5·9 (14)	120°·3 (4)	23·5 (4)	44·4 (16)	48·0 (16)	35·5 (16)	13·8 (16)	47·5 (20)	25·3 (20)

	Occipital Max. Sub. to λ Op.		Max. Sub. to $N\lambda$		Max. Sub. to GI		Sp.		Sub. from $\frac{1}{2}$ Bas.—Sp. Chord		N. S.		Vert. Tang. to Alv. N. S. Arc	
	x from λ	y	x from N	y	x from G	y	x from N	y	x from Bas.	y	x from N	y	x from N	y
♂	51·8 (115)	27·2 (115)	85·5 (117)	69·9 (117)	99·7 (116)	101·7 (116)	69·7 (111)	33·4 (111)	11·9 (111)	0·8 (111)	6·1 (83)	49·7 (83)	4·2 (85)	56·0 (85)
♀	46·9 (23)	24·7 (23)	77·9 (20)	64·9 (20)	93·7 (21)	95·0 (21)	66·8 (21)	32·3 (21)	10·6 (21)	0·9 (21)	5·2 (15)	46·4 (15)	2·6 (18)	51·4 (18)

* The occipital points are above the $N\gamma$ line.

it is found that the Spitalfields values fall within these in every case. The present series appears to possess no unusual feature which can be estimated in this way. The type is small, but all three sections are "well-filled." The orthognathous facial skeleton and protruding occipital bone are typically European. Marked differences are found from the contours of the seventeenth-century London series from Whitechapel and Farringdon Street on account of the greater height, shorter length and higher cephalic index of the Spitalfields type. The most interesting comparison is that between the Farringdon Street and Spitalfields sagittal figures. With the nasion and $N\gamma$ lines coincident the sections of the facial skeleton almost over-lap and the basions are also very close in spite of the marked differences between the basio-bregmatic heights. The markedly retreating frontal bone of the earlier-studied London types distinguishes them most clearly from the Spitalfields one. The components of this character have been measured by the angle between the base of the frontal bone—the $N\beta$ chord—and the line joining the nasion to the point of maximum subtense to $N\beta$, and the angle between the horizontal represented by the $N\gamma$ line and $N\beta$. The "Physiognomic Angle of Flatness" is the sum of these two angles. Measurements of the English types are given below:

	Angle of Frontal Bone Flatness	$\angle \beta N\gamma$	Physiognomic Angle of Flatness
Whitechapel ♂	26°·6	47°·1	73°·7
Farringdon St ♂	28°·9	45°·2	74°·1
Spitalfields ♂	25°·7	49°·3	75°·0
Farringdon St ♀	30°·5	44°·0	74°·5
Spitalfields ♀	28°·0	49°·5	77°·5

The greatest differences are seen to be between the degrees of rotation of the base of the frontal bone, and in spite of its more prominent sinciput the Spitalfields type has the flatter section of the bone.

(9) *Conclusions.* The subject of the present paper is a series of crania discovered in 1926 during excavations on the site of Spitalfields Market, London. About 950 individuals are represented, but the majority of the skulls are fragmentary. The burial-ground probably contained at least 3000 complete bodies which were interred without any orderly arrangement and apparently at one time, as during a plague or other catastrophe. Owing to the complete absence of datable artefacts found in association with the bones, and of historical records relating to them, their age cannot be ascertained exactly. The site probably formed part of a Roman cemetery, and it was almost certainly within the churchyard of St Mary Spittle (1197—1537 A.D.). After the dissolution of the monasteries it became part of the Old Artillery Ground, until sold in 1683, and it was completely built over by 1688.

The ages of the individuals at death exemplify all juvenile (except very young) and adult stages. Of the adults, 590 males and 293 females were distinguished and this disproportion between the sexes, if correct, was perhaps partly occasioned by a

stringent post-mortem selection which would have favoured the preservation of the stronger male skulls. The accuracy of the sexing is checked roughly by statistical means. The series is racially homogeneous in appearance and there is every reason to believe that the males, females and children conformed to the same racial type. Samples taken from different parts of the burial-ground were found to be identical in type. The constants of variation for the total sample show that the population was less variable than the one represented by the seventeenth-century London skulls from the Farringdon Street cemetery. One specimen and one only exhibits an advanced stage of syphilis.

A comparison of the Spitalfields with all other British series for which adequate measurements are available shows that the type is markedly different from all these. The mean male cephalic index of 79·4 is alone sufficient to indicate that the sample cannot possibly have been drawn from a population which was similar to that represented by the Whitechapel ($100B/L = 74·3$), Farringdon Street (75·4) and Moorfields (75·5) seventeenth-century series. The only known British type which approximates to the present one is that of the crania preserved in the crypt of St Leonard's Church, Hythe (Kent).

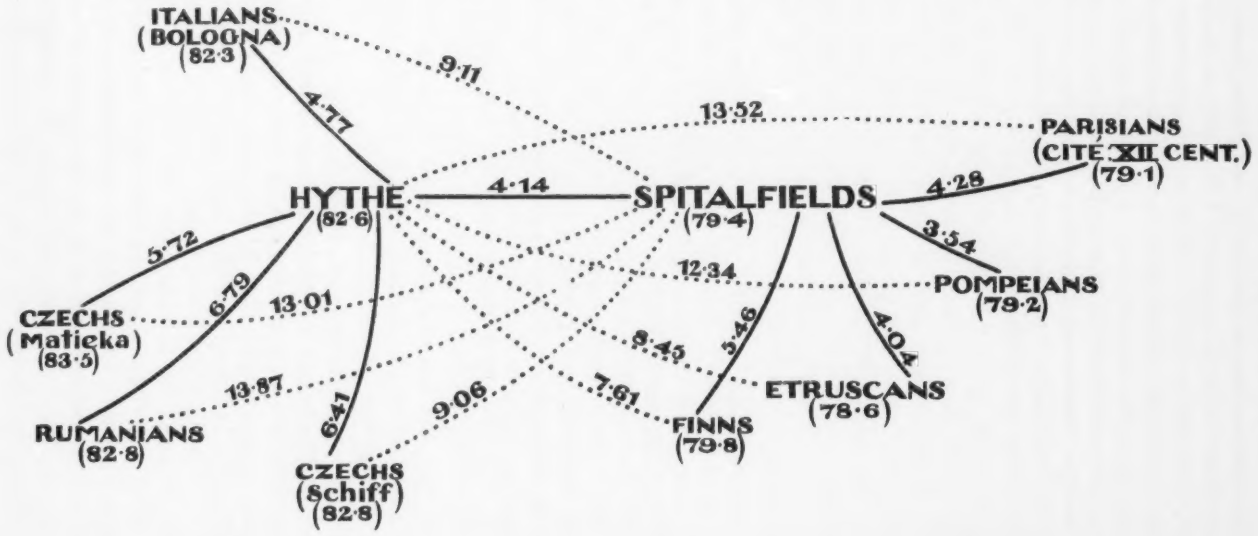
Comparisons by the method of the coefficient of racial likeness show that the connections between the Spitalfields and some other European series are as close as those normally found between neighbouring and contemporary racial types. The most similar series is one of Pompeians—the connection in this case being rather closer than that between the Whitechapel and Farringdon Street English—but Etruscans are little further removed and the next closest relationship is with twelfth-century Parisians. The Spitalfields must be considered to be a member of a group of closely allied series which includes these three, a modern Parisian series, one of Finns and another of Austrians from Vienna. These have mean male cephalic indices ranging from 78·6—81·2. The fact that the two most similar types are early ones from Italy suggests forcibly that we are dealing with an intrusive population of Roman date, but this explanation cannot be accepted without further evidence since a close relationship is also found with a Kentish population of the fourteenth and fifteenth centuries.

The few measurements of the Hythe crania provided by Professor Parsons are not sufficient to lead to any reliable measure of their degrees of relationship with other types. Far more complete measurements and type contours of 200 of the more complete specimens have recently been taken, and it is hoped that these data will be published in a later paper. The coefficients of racial likeness between the means of the male sample of 112 skulls and those of all similar European series were computed, and all the reduced values less than 7 found are shown in Fig. XIII. The lowest of these is the value of 4·14 with the Spitalfields series. All the reduced coefficients less than 7 found with the Spitalfields means are also shown, and those with the Pompeians and Etruscans are less than 4·14. The Hythe series also has close connections with modern Italians from Bologna, Czechs and Rumanians and all of these are widely removed from the Spitalfields type. The diagram suggests

FIG. XIII. THE RELATIONSHIPS OF THE SPITALFIELDS AND HYTHE SERIES.

REDUCED MALE COEFFICIENTS OF RACIAL LIKENESS { LESS THAN 7 —— / GREATER THAN 7 ·····

THE FIGURES IN BRACKETS ARE THE CEPHALIC INDICES OF THE SERIES.



that the Spitalfields and Hythe series have quite different racial affinities, although they resemble one another quite closely. The possibility that the Spitalfields population was derived from one which was native to Kent in post-Roman times cannot be ignored, in spite of the absence of historical evidence in favour of it, and that Kentish type seems to have been itself derived from one which existed in Italy in early times and which has persisted there, and in some parts of Central Europe, until to-day. The position is an anomalous one and it may not be possible to elucidate it without far more adequate material relating to the rural populations of England at different epochs.

Appendix I. Definitions of Measurements.

The majority of the index-letters denoting measurements in this paper are those usually adopted by workers in the Biometric Laboratory. Definitions are given in *Biometrika*, Vol. XXI. 1929, pp. 82—84, and a few others not included in that list are defined below.

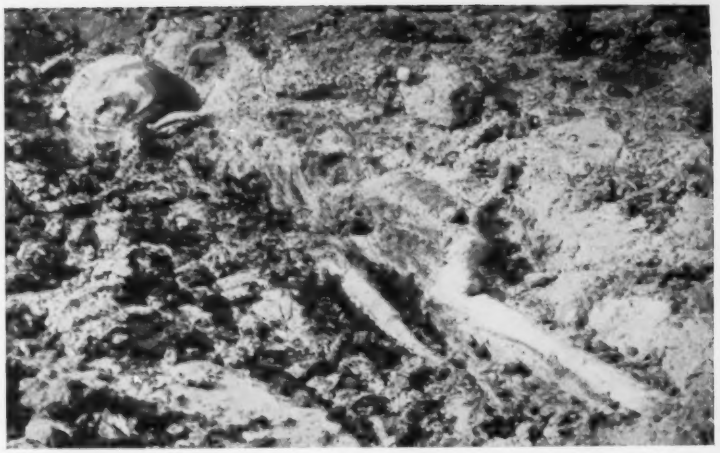
C = capacity in cm.^{3} This was found by the "crâne étalon" method first described by Macdonell in *Biometrika*, Vol. III. 1904, pp. 203—206. The standard skull δ was used and its water capacity was found to be 1365 cm.^{3}, which is precisely the same as the reading found previously by Tildesley and Morant. It was filled with mustard seed on each of the 13 days during which the capacities of the Spitalfields skulls were being dealt with. These readings range from 1029—1040 grammes and the mean is 1033·4. The means found by Macdonell (1904), Tildesley (1921) and Morant (1923) are respectively 1055·2 (4), 1064·5 (6) and 1059·9 (5) grammes. Our packing may have been less tight than that of previous workers, or a change in the condition of the seed may account for the differences observed. This is of no consequence as all our weights are closely similar to one another. The equation used to transform the weight of seed packed in the individual skulls into capacities is:

$$\text{Volume of 1000 grammes of seed} = \frac{1365 \times 1000}{1033{\cdot}4} = 1320{\cdot}8 \text{ cm.}^3$$

The formulae for English skulls predicting the capacity from the major calvarial arcs or chords (*Biometrika*, Vol. III. 1904, p. 370, and Vol. XVIII. 1926, pp. 33—35) all give mean values for the Spitalfields series which are well in excess of the mean for the direct readings. The last for the male skulls is 50 cm.^{3} less than the smallest predicted mean and this discordance is evidently due to the fact that the seventeenth-century London skulls from which the formulae were deduced are of a markedly different type from that of the Spitalfields skulls. $F.V.L$ = horizontal length from the glabella in the median sagittal plane with regard to the Frankfurt plane. This was found by drawing on the sagittal contour and it is not precisely the same as the horizontal length L' defined by Fawcett (*Biometrika*, Vol. I. 1902, pp. 414—415 and Fig. 1), since the latter does not lie necessarily in the median sagittal plane. In the case of asymmetrical skulls it has frequently been found that L' is greater than the median sagittal L, but $F.V.L$

cannot be greater than *L*. *B* = maximum horizontal breadth. The terminals of the diameter fell on the parietal bones almost without exception, and it was assumed that such was the case if one, or both, temporal bones were missing. *IOW* = internal biorbital breadth between the points, right and left, where the fronto-malar sutures cross the outer margins of the orbits. *Bregmatic OH* = vertical height of bregma from the auricular axis found with the skull in the craniophor. The auricular axis is the line joining the "porions" of Martin. *OH* = maximum projective height from the auricular axis taken perpendicular to the Frankfurt horizontal plane. *Lacrymal* O_1, *R* and *L* = breadth of orbit from lacrymal point, i.e. the point where the *crista lacrimalis posterior* meets the fronto-lacrymal suture. *Prosthion* $P\angle$ = angle between the nasio-prosthion chord and the Frankfurt horizontal plane measured with Ranke's goniometer.

(*a*) Vertical section of a bone pit, showing debris of bones, and undisturbed surfaces of pit.



(*b*) Complete and fully extended skeleton indicating that the bodies were placed whole in the pits, and that they were not clearance pits.

Excavations for Extension of Spitalfields Market, 1926

(*c*) Elm water-pipes, probably part of the conduit from the Snekockeswelle in the Bishop of London's Field.

(*a*)

(*b*)

No. 325 ♀ (*circa* ½ natural size). (*a*) *Norma lateralis* (left profile); (*b*) *Norma verticalis*. The first cephalic index ($100\,B/L$) of this skull is 79·5, the second ($100\,H'/L$) is 73·7; the corresponding female means are 79·8 and 73·7.

Normal Spitalfields Skull

ARCHIVE OF BIOMETRIKA

(*a*) Advanced Syphilis. No 131 ♀ ($\frac{1}{2}$ natural size).

(*b*) (*c*)

A diseased parietal area on skull, No. 374 ♀, shown (*b*) internally and (*c*) externally (*circa* 2 natural size).

Pathological Spitalfields Crania

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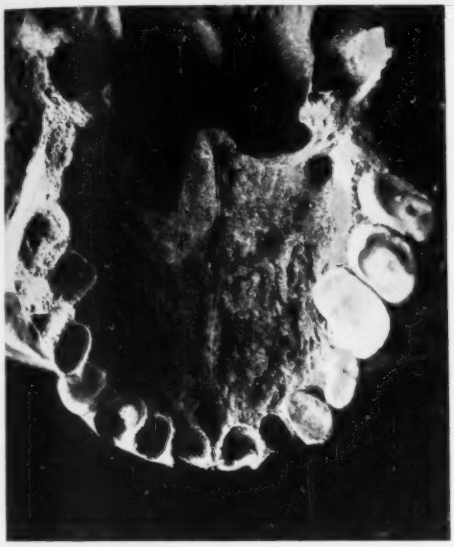
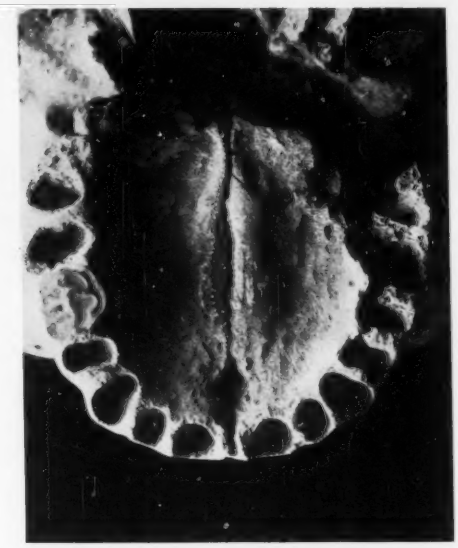
(*a*) Lambdoid suture nearly obliterated on *L*, but open on *R*. No. 342 ♂ ?
($\frac{7}{10}$ natural size).

(*b*) Metopic skull with a distinct median sagittal crest. No. 212 ♀
($\frac{8}{10}$ natural size).

Anomalous Spitalfields Crania

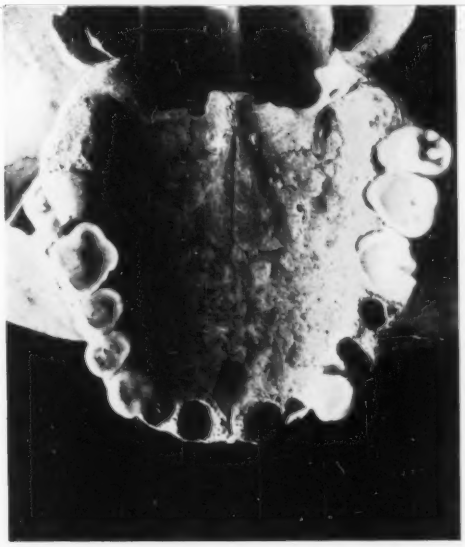


(*a*) Single *R* premolar. No. 27 ♂
(*circa* $\frac{11}{10}$ natural size).



(*b*) Single *L* premolar. No. 714 ♀
(*circa* $\frac{11}{10}$ natural size).

(*c*) Small *R* 3rd molar. No. 56 ♂
(*circa* $\frac{11}{10}$ natural size).



(*d*) Absence of *L* 3rd molar; *R* 3rd and *L* 2nd molars unworn and latter carious. No. 432 ♀ ?
(*circa* $\frac{11}{10}$ natural size).

Dental Anomalies of Spitalfields Crania

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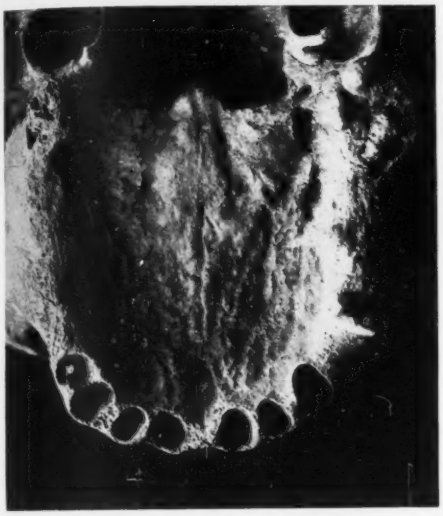
(c)



(*a*) Abscesses at sockets of 3rd molars. No. 507 ♂!? (natural size).

(*b*) Absence of canines and first *L* molar, unerupted tooth below inner alveolar rims of *L* incisors. No. 802 ♂ ? (natural size).

(*c*) Prominent and exposed socket of central *R* incisor. No. 705 ♂ ($\frac{2}{3}$ natural size).

(*d*) Absence of posterior wall of auricular passage. No. 846 ♂ ? ($\frac{2}{3}$ natural size).

Dental and other Anomalies of Spitalfields Crania

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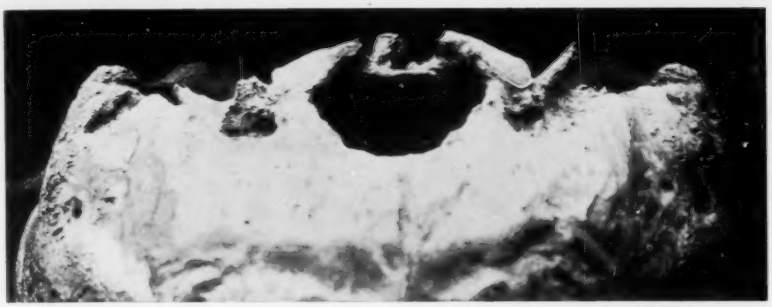
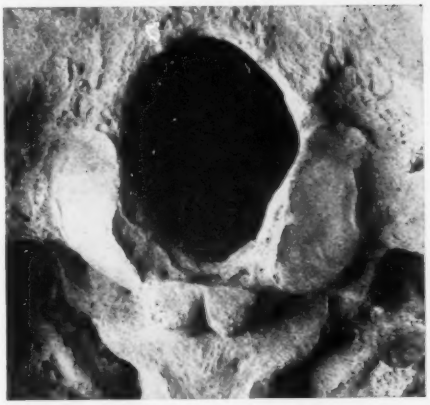
(b

(d) D

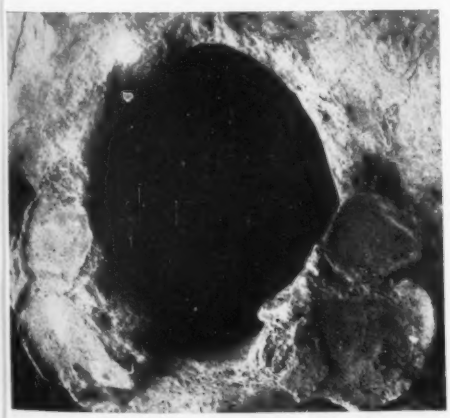


(*a*) Paroccipital processes and precondyles. No. 200 ♂ ($\frac{8}{10}$ natural size).

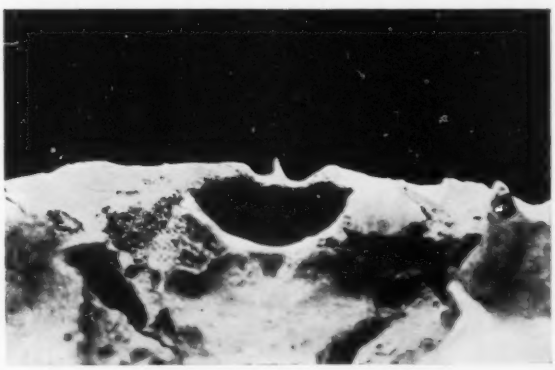
(*b*) Spine posterior to basion. No. 48 ♀ ?
($\frac{13}{10}$ natural size).



(*c*) Precondyles. No. 217 ♀
($\frac{13}{10}$ natural size).



(*d*) Divided and irregular condyles. No. 108 ♂ ?
($\frac{13}{10}$ natural size).



(*e*) Prominent external occipital crest. No. 410 ♂
($\frac{9}{10}$ natural size).

Basal Anomalies of Spitalfields Crania

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No.	Sex	C	IOW	B'	B''	B	Biasterionic B	F	F.V.L	L	H'	H	OH	Bregmatic OH
18	♂?	—	—	—	—	152	115	173·5	174	176	133	—	116	117
21	♂	—	104·5	99·8	—	146	114	177·5	182	182	—	—	115·5	115·5
23	♀	—	97·5	98·2	122	136	111	181·5	188	188	139	141	119	117·5
27	♀	1379	100	98·3	123?	142·5	—	179	182	183	129	129	116	115·5
28	♀	—	90	90·3	—	144	115	168·5	172	174	126·5	126·5	111·5	111·5
35	♀	—	93	—	—	141	106	177	179·5	180	129	131	112·5	109·5
36	♂?	—	95	96·1	116	138?	107·5	173	170·5	174·5	123?	124?	107	106·5
46	♀	—	93	96·2	127·5	150	113·5?	173	172	173	—	—	117	116·5
56	♀	—	—	—	—	—	—	181·5	—	182	144	—	—	—
63	♀	—	—	—	—	—	110	—	178	178·5	—	—	—	—
107	♂	—	101	101·4	127?	149·5	111	179	182	182	134	134	118	116·5
111	♀	—	100	102·0	124?	144	112	170·5	173·5	174	—	—	123·5	120·5
112	♂?	—	98	99·0	—	142	113·5	180	—	182	134	—	—	—
117	♀	—	96·5	90·1	118·5	135	108?	169·5	—	173	—	—	—	—
120	♂	—	98	96·9	126	150	120	189	188	189·5	134	134·5	118·5	117·5
133	♂?	—	97	95·3	—	—	—	183·5	187	187	136	136·5	116	115
200	♂	1483	102·5	102·5	126·5?	145	114·5?	179·5	179·5	181	139·5	137·5	117	116
204	♂?	1330	95·5	100·0	122	143·5	110	168	169·5	171	127	127·5	110·5	109
208	♂	1561	102·5	98·5	127?	146	105?	190	191·5	191·5	133	130·5	116	116
210	♂?	1223	94·5	96·1	120	134·5	—	173	176·5	177·5	126	126·5	112·5	111·5
214	♂	1542	102·5	99·5	130	152	112·5?	179	179	181	134	133·5	114·5	114·5
229	♀	—	99	99·3	118	139	112·5	192	195	197	142	—	118·5	118
300	♀	1431	101	102·2	126·5?	145	111·5	189	192	192	128	128	113·5	113
301	♀	1518?	101·5	103·1	131·5	151	116	178	181·5	182	138	135·5	117·5	118·5
302	♂?	1304	94	96·3	126	140	106	171	171·5	171·5	132	130·5	114·5	115·5
304	♂	1551	107	108·1	129·5?	147·5	119?	180	182·5	184	145·5?	—	124·5	123·5
308	♂?	—	92	92·6	120·5	143	—	184	—	185	142	—	—	—
319	♀	—	101	107·6	131·5	142	—	186	185	186	135	135	120·5	119?
332	♀	—	100·5	100·3	—	148	106?	172	173	174	135	132·5	115	116·5
334	♀	—	105	107·0	139?	155	—	181	182	183·5	—	—	114·5	114
401	♂	1469	—	103·6	127	141	—	186	184	186	133·5	132	118	116·5
402	♀	1213	99	92·1	113·5?	137	—	165	166·5	167	136·5	137	117·5	115·5
404	♀	1436	93·5	94·0	111·1	145	117	179	182	182	131	130	115·5	115·5
417	♂?	—	101	98·6	—	152	—	171·5	172	173	144	144·5	125·5	125·5
422	♂	—	103	—	124	149	107·5	175·5	181	181·5	142	138·5	122·5	122
501	♀	1575	100	100·0	129·5	150	111·5?	182	186	186	136	136	117·5	116
504		1354	92	90·7	123·5	145	109·5	180	184	184·5	133	132	115·5	113·5
505		1380	94	95·8	120·5	137·5	107·5	181·5	184	185	128·5	128	115	115
508	?	1316	93	93·1	—	138	115·5?	183	185·5	186	130	129·5	113·5	114
513	?	1539	102	104·0	127	146	104·5	183	184	185	137	135	116·5	118·5
517	♂	—	100	103·6	128	153	—	175	—	180?	136·5	—	—	—
525	♂?	1491	97	96·6	—	145·5	115	173	175	175	140	139·5	120·5	119
533	♂	—	101	93·4	118	137	—	180	—	184	137·5	—	—	—
602	♀	1627	104·5	103·4	128	150·5	106	188·5	190	190	138·5	137	119·5	120·5
603	♀	1405	103	106·1	122	150	—	183	184·5	185	130	130·5	112·5	112·5
605	♀	1512	101	107·1	130	151	—	178	183	184	139	140	121·5	119·5
606	♀	1507	95	98·2	132	151	—	186	183·5	187	133	132·5	116·5	115
607	♂?	1279	95	89·9	117·5?	144	111	176·5	177	178	126	126	111·5	109
623	♀	—	98·5	93·0	125·5?	141·5	107	173	173·5	175·5	123	122·5	112	109·5
649	♂	—	98	100·7	130	—	—	185	187	187·5	143	142	122·5	122·5
705	♀	—	102·5	102·0	122·5	145	114·5?	178	182	182	135	134	115·5	114
707	♀	1310	—	96·3	121	143·5	—	171	175	175	138	138	114·5	113·5
728	♂?	—	103	92·2	—	—	—	—	—	176	—	—	—	—
800	♂	1548	100	99·8	124?	145	—	181·5	181·5	184	140	140·5	114·5	113·5
802	♂?	—	94	95·7	124·5	149	109?	173	171·5	174	126	127·5	116	114·5
808	♂	1561	95	96·4	121	150	—	186	188	188·5	135	135	116	116·5
812	♂?	—	93	97·1	131?	131?	—	175	175	177	137·5	136·5	113·5	111
838	♀	—	96·5	94·9	113	—	—	—	173	—	—	—	119	118
854	♂	—	99	88·1	118·5	—	—	175·5	180·5	180	132·5	135·5	118	115·5
857	♀	—	—	—	—	—	120?	—	—	—	—	—	—	—
899 D	♂?	—	—	—	—	—	—	—	—	—	—	—	—	—

OH	*Bregmatic OH*	*LB*	S_1'	S_2'	S_3'	S_1	S_2	S_3	*S*	*U*	*Broca's Q'*	*Q'*	*Bregmatic Q'*	*G'H*	*GL*	*GB*	*J*	*NL*
116	117	100·7	114·7	105·3	89·9	132	118	107·5	358	—	318	327	328	—	—	—	141·5	—
115·5	115·5	—	116·0	107·6	97·1	131·5	119	118	369	523	309?	—	319	69·9	—	—	—	52
119	117·5	100·5	114·1	123·6	93·5	128·5	141	111	381	518	305	313	314	72·1	98·2?	—	135	51
116	115·5	96·8	104·7	111·2	105·0	118·5	122	126·5	367	516	308	317	318	70·6	85·1	91·8?	134	51
111·5	111·5	92·8	111·5	105·3	91·9	127	116·5	111	354	495	305	313	314	—	—	—	129	—
112·5	109·5	95·8	105·4	110·1	93·1	119	124·5	117	361	—	295	310	303	—	—	93·3	131	52
107	106·5	—	109·0	103·2	—	125	116·5	—	—	—	292	—	300?	67·9	89·0	—	123·5?	45
117	116·5	—	108·8	107·2	99·1	127	123	118·5	369	518	316	327	322	—	—	—	—	46
—	—	103·1	117·2	118·1	98·1	130·5	133·5	118	382	—	—	—	—	—	—	—	—	51
—	—	99·7	—	—	96·2	—	—	114	—	—	—	—	—	—	—	—	—	51
118	116·5	101·3	113·0	102·8	97·4	·30	112·5	121	364	528	323?	334?	330?	64·8	97·7?	98·1	133	48
123·5	120·5	—	107·1	107·0	104·2	121·5	122·5	121	365	507	317	338	329	—	—	—	134·5	—
—	—	102·9	113·7	110·9	94·2	131	121·5	115·5	368	—	—	—	—	72·9	91·3	—	—	48
—	—	—	108·9	110·7	97·1	120·5	123	113·5	357	—	—	—	—	—	—	—	—	51
118·5	117·5	100·0	116·9	115·1	102·1	132·5	130	1 6	388	543	318	328	325	73·9	92·2	97·1	134	—
116	115	106·0	110·8	108·1	103·7	126·5	118	1 12·5	367	—	304?	315?	—	70·2	100·9	90·6	125·5	54
117	116	109·0	116·3	98·5	100·6	131	108	119	358	516	305	317	315	71·4?	98·3	89·0	136	51
110·5	109	94·0	105·5	105·6	91·2	120	116·5	111	348	504	293	307	307	69·4	85·2	89·9	134·5	53
116	116	107·9	115·6	116·1	94·7	129·5	132	115	376	530	312	328	325	76·7	100·0	—	136·5	50
112·5	111·5	99·4	110·2	106·6	87·8	124·5	121·5	104·5	350	494	303	309	308	69·5	99·7	95·0	132·5	55
114·5	114·5	98·1	112·7	115·7	92·0	131·5	128	109	368	528	316	323	323	71·8?	98·8?	92·9	137·5	50
118·5	118	101·3	116·1?	118·9	104·8	134·5?	130	128	393?	531	306	313	315	70·3	99·3	—	—	53
113·5	113	104·3	114·2	117·1	89·2	134	135	113	382	536	304	314	313	76·2	101·2	92·3?	137	49
117·5	118·5	103·9	115·1	109·2	99·9	129·5	120	117·5	366	530	321	330	330	73·5?	105·0	100·8	139·5	58
114·5	115·5	99·0	106·8	105·1	95·8	123·5	116	113	352	498	297	319	314	66·2	91·6	87·0	124	50
124·5	123·5	102·3?	116·0	112·7	103·0	130·5	127	125	383	530	322	336	335	—	—	103·9	141	55
—	—	97·1	112·5	118·6	104·0	128	131·5	127	386	528?	—	—	—	—	—	91·3	—	47
120·5	119?	99·4	109·5?	121·5	101·1	134?	138·5	124	395?	535	316	329	327	—	—	96·9	129	—
115	116·5	99·2	116·9	111·1	87·7	135·5	124	100	359	513	—	—	—	73·6	101·0	96·7	135·5	53
114·5	114	—	112·9	109·2	97·2	130	125	115	370	—	325	333	331	68·8?	—	98·5	140	50
118	116·5	96·7	113·4	113·0	95·3	131·5	126	120	378	528	307	316·5	315	—	—	89·3	126·5	49
117·5	115·5	95·2	106·8	110·0	100·1	118	121·5	119	359	483	299	315	310	64·2	93·9	99·8	132	47
115·5	115·5	96·5	114·1	114·2	94·0	128	128	117	373	514	306	318	317	69·6	92·2	93·7	—	51
125·5	125·5	102·3?	115·2	107·5	98·1	133	121	116	370	517	338	349	347	—	—	—	—	47
122·5	122	104·1	122·2	112·7	99·1	136·5	125	114	376	—	324	333	331	—	—	94·8	142	—
117·5	116	102·3	111·1	117·4	102·3	125	135	124	383	533	311	329	328	66·3?	91·5?	95·3	137·5	49
115·5	113·5	105·5	112·8	105·0	96·4	126·5	116	123	366	519	308	321	316	64·8	103·1	94·2	131·5	49
115	115	94·8	110·0	120·2	101·9	125·5	136	123	385	514	303	319	313	58·2?	90·8?	90·0	125	44
113·5	114	97·8	112·9	110·1	100·7	128·5	119	125	372	514	289	299	301	—	—	87·5	117·5	47
116·5	118·5	104·2	112·3	118·1	92·2	130	131·5	108	370	525	313	326	324	—	—	—	136	46
—	—	106·4	115·2	105·7	96·2	133	115·5	115	364	524	—	—	—	69·2	100·9	99·2	—	49
120·5	119	104·2	116·2	100·0	102·2	130·5	113·5	120	364	512	317	326	325	71·5	96·1	91·4	134	51
—	—	108·0	112·0	114·3	—	126	129	—	—	—	—	—	—	—	—	92·2	—	52
119·5	120·5	108·1	112·1	113·0	100·1	129	123	128	380	540	323	337	335	69·5?	96·6?	94·4?	141·5	52
112·5	112·5	99·0	115·2	105·0	101·2	131·5	115·5	125	373	532	301	315	315	72·5?	92·1?	93·3	138·5	53
121·5	119·5	102·1	120·1	121·2	91·0	134	139·5	110	384	533	324	338	331	—	—	100·6	141	56
116·5	115	100·8	112·3	106·9	103·8	130	118	136	384	536	312	321	322	—	—	94·2?	129	51
111·5	109	95·8	104·0	111·1	100·0	117·5	122·5	121	361	512	296	311	308	—	—	87·2	127·5	48
112	109·5	97·2	97·6	110·9	89·3	111	125·5	114	351	505	300	318	310	64·0	96·6	—	—	45
122·5	122·5	106·7	120·3	121·1	—	137	134	—	—	—	323	333	331	72·3	94·0	94·3	136	51
115·5	114	100·4	110·5	112·8	—	128	125·5	—	—	520	310	323	320	67·9	97·2	93·6	—	49
114·5	113·5	106·9	109·8	109·0	93·2	118	122·5	108	349	502	305	323	315	66·2	104·2	102·1	130·5	48
—	—	—	—	113·3	—	—	131	—	—	—	—	—	—	67·5?	—	—	—	51
114·5	113·5	100·6	112·6	113·6	106·0	124·5	132	127	383	524	307	319	317	66·8?	93·2?	—	—	—
116	114·5	96·1	109·0	107·1	92·9	126	120	115	361	513	311	328	324	66·0?	89·2?	—	—	43
116	116·5	102·1	118·1	115·5	99·3	133	128·5	125	386	532	310	321	320	77·5?	94·5?	89·7	—	52
113·5	111	100·1	110·2	110·2	87·1	127	126	105	358	495	293	306	302	63·8	90·3	90·2	—	45
119	118	95·2	108·4	—	—	121	—	—	—	—	—	—	—	—	—	96·6	124?	—
118	115·5	97·9	117·0	104·5?	97·5	130·5	—	119	—	504	—	—	—	70·0?	—	99·7?	132	50
—	—	—	—	—	101·2	—	—	122	—	—	—	—	—	—	89·8?	—	139	—
—	—	—	111·9	—	—	125·5	—	—	—	—	—	—	—	—	—	—	—	—

GB	*J*	*NH, R*	*NH, L*	*NH'*	*NB*	*DS*	*DC*	*DA*	*SS*	*SC*	O_1R	O_1L	$O_1'R$	$O_1'L$	*Lacr.* O_1R	*Lacr.* O_1L	O_2R	O_2L	G_1'	G_1	G_2	*EH*	*fml*	*fmb*
—	141·5	—	—	—	—	—	—	—	4·9	12·4	43·1	—	41·4?	—	—	—	32·8	—	—	—	—	—	34·9	33·2
—	—	52·0	—	48·8	—	—	—	—	3·7	9·2	43·5	—	41·6	—	—	—	33·1	—	—	—	—	—	—	—
—	135	51·9	50·7	48·4	24·3	—	—	—	2·9	6·4	43·5	42·0	41·0	39·8?	—	—	32·9?	32·9	47·8	50·9	—	—	38·4	29·5
91·8?	134	51·2	51·3	50·0	23·9	—	—	—	4·2	9·6	45·9	44·1	—	43·8	—	—	38·0	38·7	41·3	45·6	40·0	10·7	38·0	30·5
—	129	—	—	—	21·5	—	—	—	4·8	7·6	42·1	41·1	38·8	—	—	—	33·3	32·7	—	—	—	—	34·3	28·1
93·3	131	52·9	52·8	50·5	23·9	—	—	—	3·5	6·9	40·3	38·6	37·4?	37·0?	—	—	34·2	34·2	41·9	46·0	41·8?	—	31·2	28·0
—	123·5?	45·6	45·9	45·9	22·9	—	—	—	5·3	9·5	41·2	40·0	—	37·9	—	36·8	33·2?	34·2	46·7	50·1	—	—	—	—
—	—	46·7	46·7	46·0	20·1	—	—	—	2·6	7·7	—	41·3	—	40·0	—	—	33·2?	35·5	—	—	—	—	—	—
—	—	51·8	—	51·8	—	—	—	—	5·4	9·8	43·1	—	40·6	—	—	—	32·1	—	—	—	—	—	37·1	30·7
—	130·5	48·6	47·4	46·6	25·1	—	—	—	5·7	11·1	[illegible]	42·2	—	40·8	—	—	—	32·9	45·8	51·3	46·6	8·6	36·1	31·5
98·1	133	—	49·4	45·2	27·2	—	—	—	4·1	12·1	42·5	42·5	—	39·4	—	37·7	35·2	34·5	44·7	47·7	42·3?	9·1	35·5	33·1
—	134·5	48·2	—	46·2	—	—	—	—	5·7	9·8	44·1	—	41·1	—	39·2	—	30·8	—	—	—	—	—	—	—
—	—	51·4	50·8	50·6	20·7	—	—	—	6·0	10·8	—	43·5	—	41·2	—	—	—	34·3	42·4	47·0	—	—	34·7	—
—	—	—	50·5	49·2?	25·1	13·4	22·0	36·5	6·4	12·6	—	41·2	—	39·2	—	38·0	—	33·5	—	—	—	—	—	—
97·1	134	54·4	54·3	52·8	27·5	13·7	23·1	37·5	5·2	10·7	41·9	40·9	40·3	39·1	38·5?	—	35·7	35·2	45·6	49·5	39·6	14·8	36·5	29·8
90·6	125·5	51·4	51·1	48·8	26·0	9·3	20·4	30·5	3·2	6·1	42·1	41·9	40·2	40·1	37·9	37·7	32·2	31·9	46·2	50·0	—	—	37·7	29·8
89·0	136	53·1	53·2	50·1	28·7	13·1	26·3	41·4	3·9	9·1	44·2	43·2	42·8	41·9	40·7	39·0	32·9	33·1	46·5	49·9	41·8	13·2	39·1	32·4
89·9	134·5	50·3	50·3	51·0	26·9	—	—	—	6·8	11·1	40·7	40·7	37·5	—	36·3	—	34·9	34·4	44·9	48·3	—	—	35·6	30·2
—	136·5	55·8	55·7	54·3	27·1	12·4	24·3	38·2	4·7	9·7	44·4	45·7	43·8	42·8	41·1	41·5	33·7	34·1	46·9	49·9?	42·4	11·4	35·3	31·8
95·0	132·5	50·2?	50·9?	52·6?	25·6	—	23·4	—	—	11·4	41·8	41·5	40·5	39·7	39·2	38·6	29·7	28·9	47·3	51·7	41·8	11·0	33·0	27·3
92·9	137·5	53·0	51·3	49·9	26·5	12·0	25·8	40·2	4·6	9·7	43·7	41·8	40·7	39·2	39·5	38·3	29·2	29·7	46·7	49·0	—	—	40·7	31·5
—	—	49·2	49·0	49·2	27·3	—	—	—	—	—	40·8	41·1	39·2	—	—	—	33·0	33·1	47·8	51·5	—	—	37·9	—
92·3?	137	58·3	58·0	53·5	26·8	12·1	23·8	39·2	3·5	12·1	43·7	42·5	41·8	40·2	—	38·1	32·6	35·3	—	49·9	—	—	31·8	31·2
100·8	139·5	50·2	49·3	46·0	27·2	13·4	24·1	42·9	5·4	10·2	43·6	42·3	42·4	40·9	41·0	39·9	30·3	30·1	52·1	57·3	41·9	14·0	34·6	27·9
87·0	124	50·1	49·4	49·8	23·1	—	—	—	5·5	13·2	39·0	39·6	37·3	—	36·4	—	31·7	32·6	42·0	46·2	39·3	8·9	33·9	29·2
103·9	141	55·2	55·4	54·8	23·2	12·0	25·1	41·4	3·3	7·9	45·7	44·9	43·0	42·1	42·1	40·7	32·1	32·7	47·1	50·4	—	—	36·5?	30·1
91·3	—	47·8	48·2	46·5	25·1	9·7	22·7	32·6	5·0	11·0	37·9	37·7	36·1	36·1	35·3	35·3	27·9	28·2	45·0	48·1	—	—	35·1	27·5
96·9	129	—	—	—	27·1	—	—	—	4·1	10·1	42·2	41·2	—	39·9	—	38·6	32·5	31·3	—	—	—	—	30·7	27·2
96·7	135·5	53·9	53·7	53·8	23·2	—	—	—	6·4	12·1	43·4	42·4	—	38·2	—	37·9	32·7	32·9	49·5	54·4	45·8	15·5	35·1	29·8
98·5	140	50·6	50·5	48·0	27·0	12·4	27·6	29·3	5·5	10·2	44·8	44·5	41·0	41·4	40·7	39·5	36·0	34·9	46·5	51·0	—	—	—	—
89·3	126·5	49·2?	50·1?	44·9	22·4	—	—	—	3·8	10·1	40·8	41·3	38·7	—	38·0	—	33·2	33·9	43·9	48·1	—	—	36·0	29·5
99·8	132	47·7	46·7	45·1	27·0	13·7	23·1	43·1	4·7	8·0	40·5	41·5	39·2	39·1	37·9	38·2	30·9	30·9	41·9	47·2	41·8	9·5	31·7	27·2
93·7	—	51·9	51·8	50·1	24·8	11·8	20·5	35·4	4·7	10·2	41·2	41·7	38·3	38·8	37·6	37·8	34·2	34·8	45·0	—	—	—	35·0	30·6
—	—	47·0	47·8	44·8?	25·2	—	—	—	3·5	6·3	—	44·5	—	41·3	—	40·8	—	32·9	43·7	47·7	—	—	33·9?	27·8?
94·8	142	—	47·1?	—	29·7	15·0	22·3	42·9	5·9	7·3	45·9	45·7	43·1	42·9	42·3	41·0	29·3	29·6	—	—	—	—	34·0	33·5
95·3	137·5	49·4?	49·5?	46·0	24·7	—	21·6	—	6·3	12·0	45·7	44·5	43·8	42·9	42·5	—	31·4	31·9	40·5?	44·6	—	—	35·8	27·8
94·2	131·5	49·4	49·0	49·3	26·1	12·0	21·8	36·0	5·4	8·8	40·5	39·1	38·5	36·4	36·7	35·6	29·6	29·7	47·8	54·0	—	—	31·5	26·5
90·0	125	44·7	44·8	42·9	23·2	—	—	—	5·1	9·9	39·3	39·2	—	36·7	—	35·9	30·8	30·5	42·5	49·2	45·6	9·5?	30·1	25·0
87·5	117·5	47·9	49·4	44·6	24·3	9·3	19·9	—	3·7	10·7	41·4	41·2	40·3	40·1	37·6	37·8	32·4	32·6	46·1	52·5	—	—	34·6	29·3
—	136	46·9	47·0	—	24·0	—	—	—	3·3	10·2	43·5	41·9?	41·5	—	40·4	—	34·4	34·2?	44·4	49·1	—	—	36·0	29·5
99·2	—	49·8?	49·5?	47·2	27·1	—	—	—	6·1	10·8	46·4	43·9	—	40·9	—	40·5	30·7	32·2	45·9	52·3	45·3	11·9	32·6	28·3
91·4	134	51·0	51·4	50·8	24·4	14·6	18·2	41·2	6·2	8·1	44·1	42·0	40·9	40·7	39·8	39·2	32·8	32·5	44·2	48·4	—	—	35·9	30·8
92·2	—	52·1	51·5	51·0	27·0	—	—	—	5·1	11·2	44·3	43·8	42·1	—	40·0	—	31·9	29·7	—	—	—	—	—	—
94·4?	141·5	52·9	51·0	53·8	24·9	12·4?	26·5?	39·1?	3·9	9·1	45·0	43·5	42·0	41·5?	41·3	39·8?	32·9	32·9	43·0	47·4	38·4	8·1	35·2	29·0
93·3	138·5	53·0	53·5	51·0	23·4	14·5	25·1	38·3	3·9	8·5	42·4	41·8	39·9	39·1	39·0	38·7	35·0	34·9	43·0	46·6	—	—	34·0	29·8
100·6	141	56·7	57·7	—	30·8	13·4	22·2	37·8	6·6	12·7	41·8	43·8	40·4	41·4	39·3	39·4	29·1	29·8	—	—	—	—	32·2	31·7
94·2?	129	51·1	51·2	47·6	26·5	11·7	26·3	39·2	4·8	12·9	40·0	40·0	36·8	36·4	36·4	35·5	32·0	31·9	45·4	50·5	—	—	33·5	27·0
87·2	127·5	48·2	49·4	—	23·2	—	—	—	2·8	7·5	42·5	41·2	—	39·6	—	37·0	33·1	32·9	—	—	—	—	32·3	—
—	—	45·5	47·1	45·1	22·1	—	—	—	5·4	9·8	—	40·5	—	39·2	—	38·2	29·9?	28·3	—	—	—	—	31·7	29·8
94·3	136	51·7	50·4	49·2	23·0	11·2	21·7	40·1	5·5	11·8	42·2	41·8	40·0	40·3	38·9	39·2	33·5	33·5	44·1	48·4	—	—	—	—
93·6	—	49·3	48·0	46·7	25·7	9·4	22·9	30·0	2·8	6·0	44·0	43·0	42·9	41·5	41·1	40·3	31·2	31·2	46·3	51·0?	—	—	—	—
102·1	130·5	48·1	47·6	45·9	25·8	—	—	—	3·4	9·5	42·5	41·3	—	38·4	—	37·8	31·4	31·2	48·2	51·7	42·9	10·4	38·2	30·0
—	—	51·9?	—	46·8?	26·4?	—	—	—	4·5	11·0	43·2	—	42·1	—	40·5	—	31·4	—	—	—	—	—	—	—
—	—	—	47·7	46·8?	—	—	—	—	3·8	13·3?	—	41·5	—	39·2	—	37·7	—	31·9	—	—	—	—	35·7	30·4
—	—	43·8	44·3	41·8	23·7	—	—	—	3·9	8·5	42·6	40·9	38·7	—	36·6	—	31·1	31·9	43·4	47·1	36·9	9·3	32·8	—
89·7	—	52·0	52·4	51·4	23·9	—	—	—	—	—	—	39·9	—	37·8	—	37·1	31·9	31·8	—	—	39·2	15·2	32·5	27·3
90·2	—	45·0	45·9	45·1	21·9	—	—	—	—	—	41·0	40·0	—	37·5	—	36·9	30·8	30·7	41·5	46·5	—	—	39·3	29·4
96·6	124?	—	—	—	—	11·0	22·7	33·4	2·6	9·4	40·5	40·4	38·8	39·4	37·7	37·6	31·5	32·0	—	—	—	—	33·7	28·4
99·7?	132	50·9	50·6	50·7	26·6	—	—	—	3·5	8·0	42·8	43·1	41·1	—	40·2	—	31·3	32·3	45·4	48·1	—	—	39·0	29·8
—	139	—	—	—	27·0	—	—	—	—	—	—	—	—	—	—	—	—	—	43·4	47·9	—	—	34·3	30·8
—	—	—	—	—	—	—	—	—	5·3?	9·2?	—	43·2	—	41·4	—	40·1	—	32·8	—	—	—	—	—	—

APPENDIX II. *Individual Measurements of Spitalfields Skulls.* I. *Male Skulls.*

G_1	EH	fml	fmb	100 $\frac{B}{L}$	100 $\frac{B}{F.V.L}$	100 $\frac{H'}{L}$	100 $\frac{H}{L}$	100 $\frac{H}{F.V.L}$	100 $\frac{B}{H'}$	100 $\frac{B}{H}$	100 $\frac{(B-H')}{L}$	*Oc. I.*	100 $\frac{fmb}{fml}$	100 $\frac{G'H}{GB}$	100 $\frac{NB}{NH'}$	100 $\frac{NB}{NH'}, R$
—	—	34·9	33·2	86·4	87·4	75·6	—	—	114·3	—	10·8	60·3	95·1	—	—	—
—	—	—	—	80·2	80·2	—	—	—	—	—	—	59·0	—	—	—	—
—	—	38·4	29·5	72·3	72·3	73·9	75·0	75·0	97·8	96·5	−1·6	61·0	79·3	—	50·2	46·8
40·0	10·7	38·0	30·5	77·9	78·3	70·5	70·5	70·9	110·5	110·5	7·4	59·6	80·3	76·9?	47·8	46·7
—	—	34·3	28·1	82·8	83·7	72·7	72·7	73·5	113·8	113·8	10·1	59·4	81·9	—	—	—
41·8?	—	31·2	28·0	78·3	78·6	71·7	72·8	73·0	109·3	107·6	6·7	55·9	89·7	—	47·3	45·2
—	—	—	—	79·1?	80·9?	70·5?	71·1?	72·7?	112·2?	111·3?	18·6?	—	—	—	49·9	50·2
—	—	—	—	86·7	87·2	—	—	—	—	—	—	60·3	—	—	43·7	43·0
—	—	37·1	30·7	—	—	79·1	—	—	—	—	—	59·8	82·7	—	—	—
46·6	8·6	36·1	31·5	—	—	—	—	—	—	—	—	61·2	87·3	—	54·1	51·6
42·3?	9·1	35·5	33·1	82·1	82·1	73·6	73·6	73·6	111·6	111·6	8·6	57·4	93·2	66·1	60·2	—
—	—	—	—	82·8	83·0	—	—	—	—	—	—	63·6	—	—	—	—
—	—	34·7	—	78·0	—	73·6	—	—	106·0	—	4·4	58·3	—	—	40·9	40·3
—	—	—	—	78·0	—	—	—	—	—	—	—	62·8	—	—	51·0?	—
39·6	14·8	36·5	29·8	79·2	79·8	70·7	71·0	71·8	111·9	111·5	8·4	57·8	81·6	76·1	52·1	50·6
—	—	37·7	29·8	—	—	72·7	73·0	73·0	—	—	—	61·6	79·0	77·5?	53·3	50·6
41·8	13·2	39·1	32·4	80·1	80·8	77·1	76·0	76·6	103·9	105·5	3·0	61·4	82·9	80·2	57·3	54·0
—	—	35·6	30·2	83·9	84·7	74·3	74·6	75·2	113·0	112·5	9·6	58·8	84·8	77·2	52·7	53·5
42·4	11·4	35·3	31·8	76·2	76·2	69·5	68·1	68·1	109·8	111·9	6·8	59·0	90·1	—	49·9	48·6
41·8	11·0	33·0	27·3	75·8	76·2	71·0	71·3	71·7	106·7	106·3	4·8	60·9	82·7	73·2	48·7?	51·0?
—	—	40·7	31·5	84·0	84·9	74·0	73·8	74·6	113·4	113·9	9·9	61·2	77·4	77·3?	53·1	50·0
—	—	37·9	—	70·6	71·3	72·1	—	—	97·9	—	−1·5	58·6	—	—	55·5	55·5
—	—	31·8	31·2	75·5	75·5	66·7	66·7	66·7	113·3	113·3	8·9	56·3	98·1	82·6?	50·1	46·0
41·9	14·0	34·6	27·9	83·0	83·2	75·8	74·5	74·7	109·4	111·4	7·1	62·1	80·6	72·9?	59·1	54·2
39·3	8·9	33·9	29·2	81·6	81·6	77·0	76·1	76·1	106·1	107·3	4·7	61·7	86·1	76·1	46·4	46·1
—	—	36·5?	30·1	80·2	80·8	79·1?	—	—	101·4?	—	1·1?	59·0	82·5?	—	42·3	42·0
—	—	35·1	27·5	77·3	—	76·8	—	—	100·7	—	0·5	58·6	78·3	—	54·0	52·5
—	—	30·7	27·2	76·3	76·8	72·6	72·6	73·0	105·2	105·2	3·8	58·2	88·6	—	—	—
45·8	15·5	35·1	29·8	85·1	85·5	77·6	76·1	76·6	109·6	111·7	7·5	66·4	84·9	76·1	43·1	43·0
—	—	—	—	84·5	85·2	—	—	—	—	—	—	61·4	—	69·8?	56·3	53·4
—	—	36·0	29·5	75·8	76·6	71·8	71·0	71·7	105·6	106·8	4·0	56·7	81·9	—	49·9	45·5?
41·8	9·5	31·7	27·2	82·0	82·3	81·7	82·0	82·3	100·4	100·0	0·3	60·9	85·8	64·3	59·9	56·6
—	—	35·0	30·6	79·7	79·7	72·0	71·4	71·4	110·7	111·5	7·7	57·3	87·4	74·3	49·5	47·8
—	—	33·0?	27·8?	87·9	88·4	83·2	83·5	84·0	105·6	105·2	4·6	61·5	82·0?	—	56·3?	53·6
—	—	34·0	33·5	82·1	82·3	78·2	76·3	76·5	104·9	107·6	3·9	65·0	98·5	—	—	—
—	—	35·8	27·8	80·6	80·6	73·1	73·1	73·1	110·3	110·3	7·5	59·2	77·7	69·6?	53·7	50·0?
—	—	31·5	26·5	78·6	78·8	72·1	71·5	71·7	109·0	109·8	6·5	56·0	84·1	68·8	53·1	52·8
45·6	9·5?	30·1	25·0	74·3	74·7	69·5	69·2	69·6	107·0	107·4	4·9	59·5	83·1	64·7?	54·1	51·9
—	—	34·6	29·3	74·2	74·4	69·9	69·6	69·8	106·2	106·6	4·3	57·5	84·7	—	54·5	50·7
—	—	36·0	29·5	78·9	79·3	74·1	73·0	73·4	106·6	108·1	4·9	62·6	81·9	—	—	51·2
45·3	11·9	32·6	28·3	85·0?	—	75·8?	—	—	112·1	—	9·2?	60·4	86·8	69·8	57·4	54·4
—	—	35·9	30·8	83·1	83·1	80·0	79·7	79·7	103·9	104·3	3·1	62·2	85·8	78·2	48·0	47·8
—	—	—	—	74·5	—	74·7	—	—	99·6	—	−0·3	—	—	—	52·9	51·8
38·4	8·1	35·2	29·0	79·2	79·2	72·9	72·1	72·1	108·7	109·9	6·3	55·9	82·4	73·6?	46·3	47·1
—	—	34·0	29·8	81·1	81·3	70·3	70·5	77·7	115·4	114·9	10·8	57·8	87·6	77·7?	45·9	44·2
—	—	32·2	31·7	82·1	82·5	75·5	76·1	76·5	108·6	107·9	6·5	59·4	98·4	—	—	54·3
—	—	33·5	27·0	80·7	82·3	71·1	70·9	72·2	113·5	114·0	9·6	55·0	80·6	—	55·7	51·9
—	—	32·3	—	80·9	81·4	70·8	70·8	71·2	114·3	114·3	10·1	59·3	—	—	—	48·1
—	—	31·7	29·8	80·6	81·6	70·1	70·9	71·8	115·0	113·7	10·5	56·0	94·0	—	49·0	48·6
—	—	—	—	—	—	76·3	75·7	75·9	—	—	—	—	—	76·7	46·7	44·5
—	—	—	—	79·7	79·7	74·2	73·6	73·6	107·4	108·2	5·5	—	—	72·5	55·0	52·1
42·9	10·4	38·2	30·0	82·0	82·0	78·9	78·9	78·9	104·0	104·0	3·1	63·8	78·5	64·8	56·2	53·6
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	56·4?	50·9?
—	—	35·7	30·4	78·8	79·9	76·1	76·4	77·4	103·6	103·2	2·7	60·2	85·2	—	—	—
36·9	9·3	32·8	—	85·6	86·9	72·4	73·3	74·3	118·3	116·9	13·2	57·6	—	—	56·7	54·1
39·2	15·2	32·5	27·3	79·6	79·8	71·6	71·6	71·8	111·1	111·1	8·0	56·7	84·0	84·2?	46·5	46·0
—	—	39·3	29·4	74·0?	74·9?	77·7	77·1	78·0	95·3?	96·0?	−3·7?	59·6	74·8	70·7	48·6	48·7
—	—	33·7	28·4	—	—	—	—	—	—	—	—	—	84·3	—	—	—
—	—	39·0	29·8	—	—	73·6	75·3	75·1	—	—	—	58·6	76·4	70·2?	52·5	52·3
—	—	34·3	30·8	—	—	—	—	—	—	—	—	59·6	89·8	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

100 $\frac{NB}{\overline{NH}'}$	100 $\frac{NB}{\overline{NH}, R}$	100 $\frac{NB}{\overline{NH}, L}$	100 $\frac{DS}{DC}$	100 $\frac{SS}{SC}$	100 $\frac{O_2}{O_1, R}$	100 $\frac{O_2}{O_1, L}$	100 $\frac{O_2}{O_1'', R}$	100 $\frac{O_2}{O_1'', L}$	100 $\frac{O_2}{Lacr.\,O_1, R}$	100 $\frac{O_2}{Lacr.O_1, L}$	100 $\frac{G_2}{G_1}$	100 $\frac{G_2}{G_1'}$	100 $\frac{EH}{G_2}$	$N\angle$	$A\angle$	$B\angle$	$\frac{Alv.}{P\angle}$	$\frac{Pros.}{P\angle}$
—	—	—	—	39·5	76·1	—	79·3?	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	40·2	76·1	—	79·6	—	—	—	—	—	—	—	—	—	86°·3	85°·0
50·2	46·8	47·9	—	45·3	75·6?	78·3	80·2?	82·7?	—	—	—	—	—	66°·9?	70°·9?	42°·4?	82°·0?	80°·3
47·8	46·7	46·6	—	43·8	82·8	87·8	—	88·4	—	—	87·7	96·7	26·8	58°·6	76°·4	45°·0	91°·2	88°·9
—	—	—	—	63·2	79·1	79·6	85·8	—	—	—	—	—	—	—	—	—	—	—
47·3	45·2	45·3	—	50·7	84·9	88·6	91·4?	92·4?	—	—	90·9?	99·8?	—	—	—	—	—	88°·3?
49·9	50·2	49·9	—	55·8	80·6?	85·5	—	90·2	—	—	92·9	—	—	—	—	—	87°·2	85°·4
43·7	43·0	43·0	—	33·8	—	86·0	—	88·7	—	—	—	—	—	—	—	—	—	—
—	—	—	—	55·1	74·5	—	79·1	—	—	—	—	—	—	—	—	—	—	—
54·1	51·6	53·0	—	51·4	—	78·9	—	80·6	—	—	90·8	101·7	18·5	68°·1?	75°·0?	36°·9?	—	81°·9?
50·2	—	55·1	—	33·9	82·8	81·2	—	87·6	—	91·5	88·7?	94·6?	21·5?	68°·0?	74°·1?	37°·9?	86°·9	85°·3
—	—	—	—	58·2	69·8	—	74·9	—	78·6	—	—	—	—	—	—	—	82°·0	79°·0
40·9	40·3	40·7	—	55·6	—	78·9	—	83·3	—	—	—	—	—	59°·7	76°·8	43°·5	—	—
51·0?	—	49·7	60·9	50·8	—	81·3	—	85·5	—	88·2	—	—	—	—	—	—	—	—
52·1	50·6	50·6	59·3	48·6	85·2	86·1	88·6	90·0	92·7?	—	80·0	86·8	37·4	61°·8	73°·4	44°·8	89°·0	88°·0
53·3	50·6	50·9	45·6	52·5	76·5	76·1	80·1	79·6	85·0	84·6	—	—	—	66°·2	74°·5	39°·3	83°·7	82°·9
57·3	54·0	53·9	49·8	42·9	74·4	76·6	76·9	79·0	80·9	84·9	83·8	89·9	31·6	62°·9?	78°·3?	38°·8?	89°·4?	88°·0
52·7	53·5	53·5	—	61·3	85·7	84·5	93·1	—	96·2	—	—	—	—	60°·5	74°·4	45°·1	86°·9	85°·8
49·9	48·6	48·7	51·0	48·5	75·9	74·6	76·9	79·7	82·0	82·2	85·0?	90·4	26·9	62°·9	74°·2	42°·9	90°·9	89°·4
48·7?	51·0?	50·3?	—	—	71·1	69·6	73·3	72·8	75·8	74·9	80·9	88·4	26·3	69°·8	69°·7	40°·3	85°·3	84°·9
53·1	50·0	51·7	46·5	47·4	66·8	71·1	71·7	75·8	73·9	77·6	—	—	—	69°·0?	68°·4?	42°·6?	82°·0?	80°·7
55·5	55·5	55·7	—	—	80·9	80·5	84·2	—	—	—	—	—	—	67°·8	71°·3	40°·9	81°·4	81°·4
50·1	46·0	46·2	50·8	28·9	74·6	83·1	78·1	87·8	—	92·7	—	—	—	66°·0	70°·7	43°·3	86°·9	85°·8
59·1	54·2	55·2	55·6	52·9	69·5	71·2	71·5	73·6	73·9	75·5	73·1	80·4	33·4	70°·1?	68°·8?	41°·1?	82°·7?	81°·4
46·4	46·1	46·8	—	41·7	81·3	82·3	85·0	—	87·1	—	85·1	93·6	22·6	63°·7	76°·0	40°·3	87°·9	86°·8
42·3	42·0	41·9	47·8	41·8	70·2	72·8	74·7	77·7	76·3	80·4	—	—	—	—	—	—	—	—
54·0	52·5	52·1	42·7	45·5	73·6	74·8	77·3	78·1	79·9	79·9	—	—	—	—	—	—	—	—
—	—	—	—	40·6	77·0	76·0	—	78·4	—	81·1	—	—	—	—	—	—	—	—
43·1	43·0	43·2	—	52·9	75·3	77·6	—	86·1	—	86·8	84·2	92·7	33·8	69°·6	67°·4	43°·0	78°·9	78°·0
56·3	53·4	53·5	44·9	53·9	80·4	78·4	87·8	84·3	88·5	88·4	—	—	—	—	—	—	85°·0?	84°·6
49·9	45·5?	44·7?	—	37·6	81·4	82·1	85·8	—	87·4	—	—	—	—	—	—	—	—	—
59·9	56·6	57·8	59·3	58·8	76·3	74·5	78·8	79·0	81·5	80·9	88·6	99·8	22·7	69°·0	71°·4	39°·6	79°·3?	77°·4
49·5	47·8	47·9	57·6	46·1	83·0	83·5	89·3	89·7	91·0	92·1	—	—	—	65°·1	71°·9	43°·0	84°·7	83°·6
56·3?	53·6	52·7	—	55·6	—	73·9	—	79·7	—	80·6	—	—	—	—	—	—	—	—
—	—	63·1?	67·3	80·8	63·8	64·8	68·0	69·0	69·3	72·2	—	—	—	—	—	—	—	—
53·7	50·0?	49·9?	—	52·5	68·7	71·7	71·7	74·4	73·9	—	—	—	—	61°·1?	79°·5?	39°·4?	88°·2?	87°·9
53·1	52·8	53·3	55·0	61·4	73·1	76·0	76·9	81·6	80·7	83·4	—	—	—	69°·9	74°·0	36°·1	86°·4?	85°·5
54·1	51·9	51·8	—	51·5	78·4	77·8	—	83·1	—	85·0	92·7	107·3	20·8?	68°·0?	75°·7?	36°·3?	86°·7?	85°·5
54·5	50·7	49·2	46·7	34·6	78·3	79·1	80·4	81·3	86·2	86·2	—	—	—	—	—	—	—	—
—	51·2	51·1	—	32·4	79·1	81·6?	82·9	—	85·1	—	—	—	—	—	—	—	—	—
57·4	54·4	54·7?	—	56·5	66·2	73·3	—	78·7	—	79·5	86·6	98·7	26·3	66°·2	75°·0	38°·8	—	—
48·0	47·8	47·5	80·2	76·5	74·4	77·4	80·2	79·9	82·4	82·9	—	—	—	63°·7	74°·6	41°·7	85°·9	83°·8
52·9	51·8	52·4	—	45·5	72·0	67·8	75·8	—	79·7	—	—	—	—	—	—	—	—	—
46·3	47·1	48·8	46·8?	42·9	73·1	75·6	78·3	79·3?	79·7	82·7?	81·0	89·3	21·1	61°·2?	79°·7?	39°·1?	95°·5?	94°·3
45·9	44·2	43·7	57·8	45·9	82·5	83·5	87·7	89·3	89·7	90·2	—	—	—	62°·4?	73°·2?	44°·4?	90°·9?	89°·8
—	54·3	53·4	60·4	52·0	69·6	68·7	72·0	72·0	74·0	75·6	—	—	—	—	—	—	—	—
55·7	51·9	51·8	44·5	37·2	80·0	79·7	87·0	87·6	87·9	89·9	—	—	—	—	—	—	—	—
—	48·1	47·0	—	37·3	77·9	79·9	—	83·1	—	88·9	—	—	—	—	—	—	—	—
49·0	48·6	46·9	—	55·1	—	69·9	—	72·2	—	74·1	—	—	—	70°·1	71°·3	38°·6	83°·8	82°·0
46·7	44·5	45·6	65·4	46·6	79·4	80·1	83·7	83·1	86·1	85·5	—	—	—	59°·7	78°·7	41°·6	87°·9	87°·0
55·0	52·1	53·5	41·0	46·7	70·9	72·6	72·7	75·2	75·9	77·4	—	—	—	67°·2	72°·7	40°·1	84°·8	84°·5
56·2	53·6	54·2	—	35·8	73·9	75·5	—	81·3	—	82·5	83·0	89·0	24·2	69°·4	74°·2	36°·4	83°·0	81°·2
56·4?	50·9?	—	—	40·9	72·7	—	74·6	—	77·5	—	—	—	—	—	—	—	—	—
—	—	—	—	28·6?	—	76·9	—	81·4	—	84·6	—	—	—	63°·2?	77°·0?	39°·8?	81°·6?	81°·4
56·7	54·1	53·5	—	45·9	73·0	78·0	80·4	—	85·0	—	78·3	85·0	25·2	63°·5?	75°·1?	41°·4?	92°·7?	90°·0
56·5	46·0	45·6	—	—	—	79·7	—	84·1	—	85·7	—	—	38·8	62°·0?	73°·1?	44°·9?	88°·6?	88°·5?
48·6	48·7	47·7	—	—	75·1	76·7	—	81·9	—	83·2	—	—	—	61°·9	78°·9	39°·2	87°·5	86°·9
—	—	—	48·5	27·7	77·8	79·3	81·2	81·2	83·6	85·1	—	—	—	—	—	—	—	—
52·5	52·3	52·6	—	43·8	73·1	74·9	76·2	—	77·9	—	—	—	—	—	—	—	88°·0	87°·1
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	57·6?	—	75·9	—	79·2	—	81·8	—	—	—	—	—	—	—	—

$N\angle$	$A\angle$	$B\angle$	*Aln.* $P\angle$	*Pros.* $P\angle$	θ_1	θ_2	Remarks
—	—	—	—	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing.
—	—	—	86°·3	85°·0	—	—	Sagittal suture closed. Teeth worn; none lost R. before death; 2 molars carious.
66°·9?	70°·9?	42°·4?	82°·0?	80°·3	31°·1?	11°·3?	Wormians in lambdoid suture R. and L. Ossicle of λ. JL. Teeth slightly worn and none lost L. before death.
58°·6	76°·4	45°·0	91°·2	88°·9	30°·2	14°·8	Ageing; sagittal and lambdoid sutures nearly obliterated, coronal nearly closed. JR. Teeth very worn, M_2L lost before d
—	—	—	—	—	—	—	Ageing; sagittal suture nearly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. Ossicle at as
—	—	—	—	88°·3?	—	—	Aged; all sutures nearly obliterated. JR; L. jugular foramen considerably smaller than R. Single tooth very worn; all c
—	—	—	87°·2	85°·4	—	—	Sagittal suture closing. Teeth worn; 2 molars lost before death.
—	—	—	—	—	—	—	All sutures beginning to close. Wormians in lambdoid L. Ossicle at asterion L. Supernumerary bone below upper border malar bone L. Several teeth lost before death.
—	—	—	—	—	—	—	Sutures beginning to close. No teeth lost R. before death; small M_3R.
68°·1?	75°·0?	36°·9?	—	81°·9?	—	—	Sagittal suture closing, lambdoid beginning to close. Teeth very worn; 1 molar lost R. before death. JR.
68°·0?	74°·1?	37°·9?	86°·9	85°·3	25°·1?	12°·8?	All sutures closing. Wormians in lambdoid R. and L. JR. Teeth worn; 3 lost from upper jaw before death. Mandible; 7
—	—	—	82°·0	79°·0	—	—	Sagittal suture closed, coronal and lambdoid closing. Broken bridge joining lateral pterygoid plate to spina angularis of
59°·7	76°·8	43°·5	—	—	—	—	All sutures nearly closed. Wormian in lambdoid L. Teeth worn and all, or nearly all, present at death.
—	—	—	—	—	—	—	Sagittal suture closing, lambdoid beginning to close. Wormians in lambdoid R. and L. Teeth worn but none lost L. befor
61°·8	73°·4	44°·8	89°·0	88°·0	29°·2	15°·6	Sagittal suture closed, coronal and lambdoid closing. JL. Teeth worn and 3 lost before death.
66°·2	74°·5	39°·3	83°·7	82°·9	30°·1	9°·2	Ageing; all sutures closed. Wormians in lambdoid R. and L. Ossicle of λ. Ossicle at asterion R. and L. JR. Teeth worn
62°·9?	78°·3?	38°·8?	89°·4?	88°·0	27°·7?	11°·1?	Sagittal suture nearly closed, coronal and lambdoid closing. Wormian in lambdoid R. and L. Ossicle at asterion R. Fron Large precondyle R., small L. Excrescences near condyles (Plate VII *a*). JR. Asymmetrical. Teeth worn but none l
60°·5	74°·4	45°·1	86°·9	85°·8	32°·6	12°·5	Asymmetrical. J=. Rough surface of palate. Teeth worn and 3 molars lost L. before death.
62°·9	74°·2	42°·9	90°·9	89°·4	26°·2	16°·7	All sutures beginning to close. JR. Fossa in place of precondyle L. Teeth worn but none lost before death.
69°·8	69°·7	40°·5	85°·5	84°·9	24°·7	15°·8	J=. Teeth worn and 3rd molars lost before death.
69°·0?	68°·4?	42°·6?	82°·0?	80°·7	29°·0?	13°·6?	Very complex sutures. Metopic LF+RP 3 mm. Ossicle at asterion L. JR. Teeth worn but none lost before death; 1 m
67°·8	71°·3	40°·9	81°·4	81°·4	30°·8	10°·1	Ageing; sagittal suture partly obliterated, coronal nearly closed, lambdoid closing. Wormians in lambdoid R. and L. Ep
66°·0	70°·7	43°·3	86°·9	85°·8	27°·1	16°·2	Ageing; sagittal suture nearly obliterated, lamboid and coronal closed. Epipteric bones R. and L. JL. Teeth worn and
70°·1?	68°·8?	41°·1?	82°·7?	81°·4	27°·2?	13°·9?	Ageing; sagittal suture nearly obliterated, coronal and lambdoid nearly closed. Wormians in lambdoid R. and L. Ossicle
63°·7	76°·0	40°·3	87°·9	86°·8	28°·4	11°·9	Sagittal suture closing. Metopic LF+RP 4·5 mm. JR. Teeth worn but none lost before death; no 3rd molars.
—	—	—	—	—	—	—	Ageing; sagittal suture partly obliterated, lambdoid closing, coronal beginning to close. Precondyle R. JR. Teeth worn
—	—	—	—	—	—	—	Sagittal suture nearly obliterated, coronal and lambdoid open. Wormians in lambdoid R. and L. Teeth worn and 6 lost Teeth encrusted with tartar.
—	—	—	—	—	—	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. Ossicle of λ. Ossicle in sagittal suture above λ
69°·6	67°·4	43°·0	78°·9	78°·0	31°·5	9°·3	Ageing; sagittal suture obliterated, lambdoid closing, coronal open. Wormians in lambdoid R. and L. Ossicle of λ. Epi
—	—	—	85°·0?	84°·6	—	—	Metopic suture nearly obliterated LF+RP 7 mm. Wormians in lambdoid R. and L. Epipteric bones R. and L. Ossicles
—	—	—	—	—	—	—	Precondyle L. JR. Teeth worn and several diseased; 1 upper premolar lost before death. Mandible; 7 teeth lost before dea
69°·0	71°·4	39°·6	79°·3?	77°·4	31°·7?	7°·9?	Ageing; sagittal suture partly obliterated, coronal and lambdoid nearly closed. JR. Teeth worn but none lost before de
65°·1	71°·9	43°·0	84°·7	83°·6	30°·2	11°·8	Ageing; sagittal suture partly obliterated, lambdoid nearly closed, coronal closing. Wormians in lambdoid R. and L. N
—	—	—	—	—	—	—	Ageing; sagittal suture obliterated, coronal and lambdoid closed. JL. 6 or more teeth present at death; most alveoli co
—	—	—	—	—	—	—	Sagittal suture nearly obliterated. Wormian in lambdoid R. JL. Teeth greatly worn but most present at death.
61°·1?	79°·5?	39°·4?	88°·2?	87°·9	30°·7?	8°·7?	Ageing; sagittal suture nearly obliterated, coronal nearly closed, lambdoid closing. Wormian in lambdoid R. and L. JR.
69°·9	74°·0	36°·1	86°·4?	85°·5	23°·7?	12°·4?	Aged; sagittal suture nearly obliterated, lambdoid partly obliterated, coronal closing. Wormians in lambdoid R. and L.
68°·0?	75°·7?	36°·3?	86°·7?	85°·5	25°·3?	11°·0?	All sutures closing. Wormians in lambdoid R. and L. Ossicle in sagittal above λ. J=. Teeth worn but none lost before d
—	—	—	—	—	—	—	Aged; sagittal and coronal sutures nearly obliterated, lambdoid closed. Wormians in lambdoid R. and L. JL. Flatteni
—	—	—	—	—	—	—	Basal suture not obliterated. J=. No teeth lost before death; 1 molar carious.
66°·2	75°·0	38°·8	—	—	—	—	All sutures closing. Wormians in lambdoid R. and L. Teeth moderately worn but none lost before death.
63°·7	74°·6	41°·7	85°·9	83°·8	30°·4	11°·3	Aged; sagittal suture quite, lambdoid partly, obliterated, coronal nearly closed. Wormians in lambdoid R. and L. Ossic divided. Teeth worn and 6 lost before death.
—	—	—	—	—	—	—	Sagittal suture closed, coronal nearly closed, lambdoid closing. Wormian in lambdoid R. and L. Ossicle of λ. Teeth worn
61°·2?	79°·7?	39°·1?	95°·5?	94°·3	23°·3?	15°·8?	All sutures closing. Wormians in lambdoid R. and L. Metopic RF+LP 4 mm. JR. Teeth worn; 1 molar lost before de
62°·4?	73°·2?	44°·4?	90°·9?	89°·8	26°·7?	17°·7?	Sagittal suture closed, coronal nearly closed, lambdoid closing. Wormian in lambdoid R. Ossicle at asterion R. JR. death and alveoli absorbed.
—	—	—	—	—	—	—	All sutures beginning to close. Wormians in lambdoid R. and L. JR. Asymmetrical. Most teeth present at death.
—	—	—	—	—	—	—	Sagittal suture obliterated at obelion and open near bregma, lambdoid beginning to close. Tripartite interparietal bone. several lost before death.
—	—	—	—	—	—	—	Aged; sagittal and coronal sutures obliterated, lambdoid closing. Epipteric bone R. Flattening at obelion. Teeth worn
70°·1	71°·3	38°·6	83°·8	82°·0	26°·1	12°·5	Sagittal suture closing. Wormians in lambdoid R. and L. Bathrocephalic. Ossicle of λ and ossicle in sagittal suture abo Fronto-temporal articulation R. and L. Teeth moderately worn and none lost L. before death. Asymmetrical.
59°·7	78°·7	41°·6	87°·9	87°·0	32°·4	9°·2	Aged; sagittal and coronal sutures obliterated, lambdoid nearly closed. Wormians in lambdoid R. and L. Ossicle at aste
67°·2	72°·7	40°·1	84°·8	84°·5	28°·0	12°·1	Sagittal suture closed, coronal and lambdoid closing. Wormians in lambdoid R. and L. JR; both jugular foramina divi of I_1R.
69°·4	74°·2	36°·4	83°·0	81°·2	27°·6	8°·8	Wormians in lambdoid suture R. and L. Ossicle at asterion L. Asymmetrical. JL. Mandible; no teeth lost from either
—	—	—	—	—	—	—	Teeth worn but none lost R. before death; M_3R carious.
63°·2?	77°·0?	39°·8?	81°·6?	81°·4	35°·2?	4°·6?	Ageing; sagittal suture nearly obliterated, lambdoid closed, coronal nearly closed. JR. Precondyles. Asymmetrical fora
63°·5?	75°·1?	41°·4?	92°·7?	90°·0	23°·8?	17°·6?	Sagittal suture closed. Wormians in lambdoid R. and L. Teeth worn; 1 molar carious; absence of canines and M_1L, uner
62°·0?	73°·1?	44°·9?	88°·6?	88°·5?	29°·4?	15°·5?	Sagittal suture closed, coronal and lambdoid closing. Wormians in lambdoid R. and L. J=. Teeth worn; 1 molar lost b
61°·9	78°·9	39°·2	87°·5	86°·9	30°·6	8°·6	Numerous wormians in lambdoid suture R. and L. Epipteric bones R. and L. J=. Most of the teeth present at death.
—	—	—	—	—	—	—	Wormian in lambdoid suture L. Epipteric bones R. and L. J=. Pharyngeal fossa. Most of the teeth present at death.
—	—	—	88°·0	87°·1	—	—	Sagittal suture closed, coronal and lambdoid nearly closed. J=. Precondyles; large R. small L. Teeth worn and 3 cari
—	—	—	—	—	—	—	Sagittal suture closed, lambdoid closing. Wormians in lambdoid R. and L. Ossicle of λ and ossicle in sagittal suture abo
—	—	—	—	—	—	—	Sagittal suture closing.

e death.
, M_3L lost before death; single premolar R. Depression (wound?) at obelion.
nd L. Ossicle at asterion R.
th very worn; all others lost before death.

pelow upper border of temporal squama L. Nearly obliterated horizontal suture across

JR.
leath. Mandible; 7 teeth lost before death.
spina angularis of sphenoid R. Most of the teeth lost before death.
n.
t none lost L. before death.

L. JR. Teeth worn and 6 lost before death.
at asterion R. Fronto-temporal articulation R. and close approach to that condition L.
th worn but none lost before death.

death.

before death; 1 molar diseased.
doid R. and L. Epipteric bone R. Teeth worn and a few lost before death.
L. Teeth worn and all molars lost before death.
d R. and L. Ossicle of λ. JR. Teeth worn but none lost before death; 2 molars carious.
d molars.
R. JR. Teeth worn, 3 molars lost before death, 1 carious premolar.
h worn and 6 lost from upper jaw before death. Mandible; 1 tooth lost before death.

ttal suture above λ. Metopic LF+RP. JR. Teeth worn and a few lost before death.
Ossicle of λ. Epipteric bone R. JR. No teeth lost before death.
R. and L. Ossicles in coronal suture R. Teeth worn; 2 lost before death, 1 carious.
eeth lost before death. Extensive wound on frontal, both parietals and temporal bone L.
none lost before death.
doid R. and L. No teeth lost L. before death.
th; most alveoli completely absorbed.
it at death.
oid R. and L. JR. Large precondyle L. Teeth worn but none lost before death; 1 carious.
mbdoid R. and L. JR. Teeth worn but none lost before death.
t none lost before death.
d L. JL. Flattening at obelion. Most teeth present at death; 2 carious.

ath.
id R. and L. Ossicle at asterion L. Epipteric bones R. and L. JR; jugular foramen L.

cle of λ. Teeth worn but none lost before death. Excrescences on sagittal suture.
nolar lost before death; no 3rd molars.
asterion R. JR. Asymmetrical foramen magnum. Teeth worn; all molars lost before

sent at death.
interparietal bone. Wormians in lambdoid R. and L. Ossicle of λ. J=. Teeth worn and

elion. Teeth worn and 4 lost before death.
sagittal suture above λ. Small exostoses on frontal bone. Tympanic perforation L.
symmetrical.
d L. Ossicle at asterion R. Tympanic perforation L. Teeth worn; 8 present at death.
gular foramina divided. No teeth lost L. before death. Prominent and exposed socket

eth lost from either jaw before death; 1 molar carious.

Asymmetrical foramen magnum. Probably no teeth lost before death.
ines and M_1L, unerupted tooth below inner alveolar borders of I_1 and I_2L.
orn; 1 molar lost before death.
h present at death.
n present at death.
h worn and 3 carious; probably none lost before death.
sagittal suture above λ. JR. Teeth worn but none lost before death.

No.	Sex	C	IOW	B′	B″	B	Biasterionic B	F	F.V.L	L	H′	H	OH	Bregmatic OH	LB	S_1'	S_2
26	♂?	1359	—	96·8	122·5?	144·5	113	171·5	173	174·5	131	132	112·5	112·5	99·7	109·9	110
42	,,	1243	97	92·2	110?	141·5	98	169	168	171·5	134	134	112·5	112·5	98·0	111·1	102
102	,,	1351	—	96·9	116	140·5	110	175	176	176	134	134	112·5	112	98·0	106·0	109
201	,,	1527	97·5	95·7	126·5	148	108	176	177	178	131	130	114·5	115	96·0	112·1	113
203	,,	1549	100	100·2	—	143	109·5	187	187	187·5	131	130	116	114·5	101·9	116·1	110
209	,,	1293	97	100·9	124	147	113?	164·5	167·5	169	132	132·5	118·5	116	95·6	109·1	105
211	,,	1248	100·5	95·1	—	135	110·5?	176	178·5	180	129·5	129·5	109·5	109	100·4	105·9	111
215	♂	1569	101	103·2	127	147	—	186	187·5	188	138·5	136·5	121	120·5	101·7	118·4	117
226	,,	—	100	100·7	121	133	113	179	180	181	139	137·5	114	114	99·8	113·0	113
243	♂?	—	103	105·1?	126·5	141	106?	175·5	178	178	135·5	135	114·5	113·5	98·6	108·2	103
258	,,	—	—	98·0	—	—	114	190	192	192	136	135	118·5	117·5	102·9	114·7	112
303	♂	1433	100	91·3	120	135	110?	185	186·5	187	133	131·5	112	112	103·2	111·3	114
306	♂?	—	98	99·7	122	144	—	173	—	173	136·5	—	—	—	95·9	111·1	107
362	,,	—	—	—	—	—	108·5	173·5	171	174	125·5	124·5	102	102·5	96·1	101·6	106
400	,,	1225	106	99·9	118?	133	110?	175	174	176·5	124·5	123·5	109	109	100·1	105·4	106
403	♂	1275	92·5	93·8	117·5	139	—	170·5	173·5	174	133·5	135	117	115	104·9	106·1	112
405	,,	1431	99	98·6	122?	149	116	177·5	183	184	134	132·5	120·5	119·5	96·9	118·3	118
414	,,	1433	104	98·3	126	146	113?	174	176	177	138	139·5	117·5	115·5	104·2	105·2	110
420	,,	1613?	—	107·3	126?	151	117·5	185·5	188	190	137	138·5	119·5	116·5	102·1	113·8	108
423	♂?	—	100	102·3	126·5	149	—	183	184	184·5	138	138·5	123·5	—	95·3	—	—
430	♂	—	94	96·1	114·5?	137	103·5	186	189	190	137·5	137?	113	112·5?	101·3	113·0	112
449	♂?	—	96	90·6	—	—	111·5	182	182	182	132·5?	131?	115	119·5	99·8	109·5?	116
500	♂	1483	95	97·7	118·5?	142	105·5?	185	186·5	188	134	132	111·5	111·5	100·2	114·2	116
503	♂?	1157	94·5	90·2	115	138	113	166	169	169	127	126·5	107·5	106·5	98·0	105·2	99
506	♂	1470	100	97·0	120·5?	147	112	178	180	181	130	129	117	116	101·3	111·2	114
514	,,	—	99	99·2	—	134?	113	176	177	178·5	135	135·5	114·5	113	102·6	108·3	109
515	♂?	—	94	94·0	121·5	145	112	174	175·5	176	—	—	120·5	118·5	—	110·0	108
522	♂	1442	102	96·0	123	146	114·5?	178	184	184	133·5	133·5	117	116·5	107·7	110·4	104
543	♂?	—	88·5	89·9	122	150	—	164	164	165	125	125	109	108	92·6	105·6	96
544	,,	—	99	103·3	—	138	111?	183·5	180	183	138	134·5	113	113·5	103·2	111·2?	111
548	,,	—	98·5	97·7	—	145	—	—	176	176	132·5	132	112·5	111·5	98·9	111·1	111
601	,,	1131	94	91·1	119	140	112·5	166·5	168	168	124	123	111·5	112·5	91·9	109·0	104
604	,,	1412	101?	100·7	123?	145	114·5?	182	182·5	183	130	129·5	111	109	100·2	109·8	109
608	♂	—	98	97·0	116·5	139	108·5	168	166	171	135·5	135·5	113	111·5	102·9	102·2	108
618	,,	—	99	101·5	—	153	—	185·5	188	188	—	—	123	121·5	—	119·3	123
621	,,	—	101·5	101·2	—	143	—	187	188	190	140	139	118·5	117·5	104·9	118·2	11
624	,,	1606	—	97·0	130·5	159	—	188	187·5	189	134	132	119·5	120·5	103·1	117·1	12
629	♂?	1439	100	100·2	120	140?	108·5	179	178	180·5	136·5	136·5	116·5	115	101·8	115·0	10
636	,,	—	98·5	97·5	117?	141	107	170	174	175	130	129	110·5	110	102·8	111·7	9
641	,,	—	98	96·2	125?	145	—	172	172·5	174	—	—	115·5	114·5	—	106·8	10
645	,,	—	98·5	100·0	123?	137·5	—	178·5	179·5	180	137	—	115	108	98·6	108·8	11
647	,,	—	97	96·2	115·5?	134	—	177·5	181·5	182	128	127	114	112·5	99·1	112·8	11
651	,,	—	—	—	—	—	—	174·5	—	175	132	—	—	—	97·8	110·6	11
659	,,	—	—	94·8	—	—	—	174	—	179	124	—	—	—	93·2	108·9	10
708	,,	—	98	99·4	120?	139	109	178·5	183	183	136	135·5	113	114	102·9	109·9	10
727	♂	—	100·5	100·4	—	—	122·5	177·5	179	179	133·5	133	120	119·5	97·1	117·6	11
739	♂?	—	94	94·2	—	—	—	170	—	171	127	—	—	—	100·1	103·3	11
806	,,	—	92	87·7	113?	135	106	171	174	174	125·5	126	111·5	109	—	—	11
813	♂	—	99	99·2	118·5?	136?	110·5	183·5	186	186	136	136	118	115·5	103·9	112·6	12
815	,,	—	104	107·6	—	144	—	184·5	185·5	185·5	131	—	—	113	106·7	113·3	11
857	,,	—	—	—	—	—	120?	—	—	—	—	—	—	—	—	—	—

B	S_1'	S_2'	S_3'	S_1	S_2	S_3	S	U	Broca's Q'	Q'	Bregmatic Q'	$G'H$	GL	GB	J	NH, R	NH, L	NH'	NB
9·7	109·9	110·3	91·2	126	124·5	104	355	503	304	315	311	61·1	93·4	—	128	45·8	44·9	42·9	26·4
8·0	111·1	102·3	85·8	129	114·5	102	346	493	298	307	307	73·2	91·9	91·5	133	50·1	49·9	49·2	24·8
8·0	106·0	109·0	100·7	120·5	121	122·5	364	506	301	311	308	63·1?	88·2?	—	130	48·7	48·4	46·4	23·2
6·0	112·1	113·4	98·7	127·5	125·5	118	371	515	310·5	321	318	68·2	97·1	95·0	132·5	46·9	47·8	44·8?	23·8
1·9	116·1	110·6	102·7	136	122·5	123	382	534	307	?19	315	69·2	100·8	96·4	129·5	48·9	49·1	50·9	23·4
5·6	109·1	105·9	98·3	122	120	114	355	497	308	329	320	68·0	90·6	94·2	128·5	46·1	46·3	—	23·9
0·4	105·9	111·9	94·6	118	125	117	360	507	295	301	301	68·7?	97·2?	—	—	46·3	47·9	44·9	24·8
1·7	118·4	117·3	96·3	137	132	123	392	536	319	329	327	70·0?	94·1?	95·9	136	51·4	50·9	49·8	23·8
9·8	113·0	113·2	98·1	128	127·5	121	376	505	299·5	306	304	63·5	95·0	95·9	—	46·6	46·2	44·9	26·2
8·6	108·2	103·1	110·3	122·5	111	135	368	513	301	311	311	70·0	95·2	99·9	135	51·5	49·2	50·5	23·9
2·9	114·7	112·4	109·1	130·5	122	135	387	—	—	—	—	68·0	100·9	93·2	128	48·1	47·7	44·7	24·9
3·2	111·3	114·6	98·1	127·5	125	118·5	371	515	295	304	304	71·7?	98·5	91·0	127·5	51·4	52·9	49·0	24·5
5·9	111·1	107·3	99·2	130	119	121·5	370	508?	—	—	—	75·0	92·1	94·0	—	52·3	49·5	49·4	—
6·1	101·6	106·8	95·1	118·5	120	112·5	351	—	—	—	—	—	—	95·2	—	50·4	49·4	47·5	25·5
0·1	105·4	106·2	88·9	118·5	116	108	343	497	289	297	297	74·0	95·7	93·1	130·5	52·2	52·9	49·1	26·6
4·9	106·1	112·0	93·3	118	124·5	107	349	501	301	312	312	69·6	108·0	92·0	—	50·7	50·7	48·8	24·7
6·9	118·3	118·4	91·2	134·5	136	110·5	380	525	319	330	326	71·5?	97·2	95·0	137	51·5	51·5	47·5	23·4
4·2	105·2	110·2	92·2	117	126·5	113	357	512	305	320	313	71·5	98·1	—	—	—	52·4	—	—
2·1	113·8	108·2	107·9	130	119	134	383	540	313	328	323	75·5	96·6	101·2	144·5	51·0	51·7	49·8	—
5·3	—	—	94·3	140	137	114	391	528	319	—	330?	71·3	96·5	89·1	—	49·5	49·1	44·1	29·0
1·3	113·0	112·7	109·9	125	123·5	133·5	382	519	—	—	—	75·1?	91·2	91·6	—	54·0	54·8	—	22·8
9·8	109·5?	116·7	97·7	—	129·5	119	—	—	—	—	—	—	95·0?	93·1	121	50·5	49·3	48·1	26·0
0·2	114·2	116·3	96·6	128	129	118	375	527	291	302	303	73·6	89·5	91·4	127	52·7	53·5	52·2	24·3
8·0	105·2	99·4	93·1	118	108	109	335	487	281	299	294	61·5?	94·4?	93·4	129	46·3	46·2	45·1	23·5
1·3	111·2	114·5	98·0	127	127	116·5	370	519	312	326	324	69·7?	97·2?	92·9	—	50·5	51·2	49·9	26·4
2·6	108·3	109·0	101·9	122·5	121	123	366	507	296?	303	302?	68·0?	94·6?	92·4	—	48·2	49·1	47·2	22·5
—	110·0	108·7	99·2	126·5	122	120	368	509	307·5	322	322	72·0	—	94·4	130	50·6	50·2	48·6	24·8
7·7	110·4	104·3	101·0?	121	114·5	128?	363	525	309	—	323	70·5?	107·2?	—	—	53·8	52·8	52·1	26·3
2·6	105·6	96·1	90·3	123	109	113	345	497?	302	313	312	64·1	86·2	—	—	45·0	46·9	46·3	24·7
3·2	111·2?	117·8	93·1	129·5?	134	111	375?	—	—	—	—	66·3	97·8	—	—	49·7?	50·1?	49·0	25·1
8·9	111·1	111·6	93·0	127·5?	129	111	368?	—	307	320	317	70·2	92·4	84·0	130	48·9	50·0	47·8	22·0
1·9	109·0	104·3	91·0	127	115·5	107·5	350	492	300	318	311	62·1?	91·2?	91·0	—	41·1	41·0	40·0	25·8
0·2	109·8	105·7	99·9	125	116·5	122	364	527	297	309	311	71·8?	92·1?	97·5	131·5	52·1	51·0	48·7	23·3
2·9	102·2	108·2	93·1	113	121·5	112	347	493	297	307	304	63·7	102·2	89·2	—	47·2	47·1	46·9	26·4
—	119·3	122·4	96·2	135·5	135	117	387	538	336	350	344	—	—	—	—	53·8	53·4	51·0	24·2
4·9	118·2	113·0	99·9	135	125	122	382	538	315	321	321	72·0?	96·3?	95·2?	131	51·7	52·1	48·8?	26·1
3·1	117·1	123·0	90·1	136	136	113	385	550	331	343	342	72·9	90·6	—	—	53·7	55·6	51·6	25·7
1·8	115·0	108·4	100·7	131	119·5	123	374	514?	313	—	320	70·0?	96·9?	93·5	128·5	51·8	51·5	50·1	25·1
2·8	111·7	97·5	104·2	126·5	105	120	351	499	295	307	308	63·7	94·0	93·4	124·5	47·8	47·7	46·0	25·1
—	106·8	107·2	95·1	121·5	121	111	354	510	305	319	316	72·4	—	85·8	—	52·5	52·5	47·3	22·6
8·6	108·8	119·4?	97·1	124	133·5?	115	373?	509	—	—	—	61·7	87·4	—	132	45·9	45·8	43·3	24·5
9·1	112·8	112·8	90·0	125·5	125	110	361	510	293	305	305	—	—	—	125	—	47·9	—	23·7
7·8	110·6	113·0	91·1	126·5	130	108·5	365	—	—	—	—	65·1?	98·2?	—	—	46·5	45·0	—	—
3·2	108·9	100·1	96·4?	121·5	110	117·5?	349	—	—	—	—	72·0?	84·7?	—	—	50·4	50·1	48·0	23·7
2·9	109·9	107·1	—	121	115	—	—	516	298	310	309	71·9?	96·0?	—	130	51·6?	51·8?	—	24·5
7·1	117·6	115·0	90·1	135	130	109	374	532	—	—	—	69·8	100·4	—	137	49·1?	49·0	45·4	24·4
0·1	103·3	112·0	86·0	118	127	101·5	346	—	—	—	—	64·2?	97·3	85·5	—	49·8	51·2	46·9	23·0
—	—	112·1	92·8	125	129	109	363	495	291	303	302	—	87·2	92·0	117	—	—	—	—
3·9	112·6	120·6	96·9	128·5	135·5	118	382	518	301	318	317	—	—	—	—	—	—	—	—
6·7	113·3	111·4?	96·1?	128·5	—	115·5?	—	536	309	—	319	69·0?	96·8	94·2?	128	53·5	53·4	51·1	26·0
—	—	—	101·2	—	—	122	—	—	—	—	—	—	89·8?	—	139	—	—	—	27·0

GL	*GB*	*J*	*NH, R*	*NH, L*	*NH′*	*NB*	*SS*	*SC*	O_1R	O_1L	O_2R	O_2L	G_1'	G_1	G_2	*EH*	*fml*	*fmb*	100 $\frac{B}{L}$	100 $\frac{B}{F.V.L}$	100 $\frac{H'}{L}$
93·4	—	128	45·8	44·9	42·9	26·4	2·2	10·2	—	41·5	27·6?	29·5?	—	—	—	—	35·2	27·7	82·8	83·5	75·1
91·9	91·5	133	50·1	49·9	49·2	24·8	5·6	7·5	44·1	43·0	35·6	35·2	44·0	48·5	—	—	34·8	28·9	82·5	84·2	78·1
88·2?	—	130	48·7	48·4	46·4	23·2	—	—	41·6	—	32·4	—	42·2	45·0	41·9	10·6	35·5	31·0	79·8	79·8	76·1
97·1	95·0	132·5	46·9	47·8	44·8?	23·8	2·9	7·7	41·9	41·0	31·5	30·9	45·9	51·8	—	—	34·2	31·8	83·1	83·6	73·6
100·8	96·4	129·5	48·9	49·1	50·9	23·4	1·0	5·0	44·5	43·9	32·7	32·1	49·0	54·1	42·8	12·2	36·9	30·1	76·3	76·5	69·9
90·6	94·2	128·5	46·1	46·3	—	23·9	—	—	42·5	41·8	34·1	33·7	42·7	46·5	40·5	12·0	31·7	27·5	87·0	87·8	78·1
97·2?	—	—	46·3	47·9	44·9	24·8	4·0	12·0	43·1	42·5	35·3	34·8	47·9	53·3	—	—	35·8	30·3	75·0	75·6	71·9
94·1?	95·9	136	51·4	50·9	49·8	23·8	4·8	11·1	44·8	43·5	33·1	33·4	—	—	43·8	—	31·7	27·4	78·2	78·4	73·7
95·0	95·9	—	46·6	46·2	44·9	26·2	5·0	8·2	43·8	42·3	29·7	31·1	47·0	52·1	—	—	36·8	30·5	73·5	73·9	76·8
95·2	99·9	135	51·5	49·2	50·5	23·9	3·2	8·0	44·0	42·0	33·9	34·7	—	—	—	—	35·5	—	79·2	79·2	76·1
100·9	93·2	128	48·1	47·7	44·7	24·9	4·5	12·0	41·1	41·0	32·3	32·0	45·1	49·4	42·8?	8·8?	34·3	28·5	—	—	70·8
98·5	91·0	127·5	51·4	52·9	49·0	24·5	3·2	8·1	43·9	43·3	35·4	35·1	—	—	42·3	13·2	38·9	32·4	72·2	72·4	71·1
92·1	94·0	—	52·3	49·5	49·4	—	—	—	40·5	41·0	32·0	31·0	44·4	48·2	—	—	31·3	29·1	83·2	—	78·9
—	95·2	—	50·4	49·4	47·5	25·5	4·3	12·0	40·0	40·0	33·1?	32·9	—	—	40·2	10·5	36·1	30·0	—	—	72·1
95·7	93·1	130·5	52·2	52·9	49·1	26·6	3·3	11·9	44·9	43·4	36·3	36·0	44·0	48·0	—	—	37·5	29·5	75·4	76·4	70·5
108·0	92·0	—	50·7	50·7	48·8	24·7	5·1	7·2	39·8	39·8	32·8	31·9	49·2	52·5	—	—	34·5	29·3	79·9	80·1	76·7
97·2	95·0	137	51·5	51·5	47·5	23·4	5·1	7·9	44·8	45·4	34·1	34·6	46·2	49·9	44·4	12·4	38·5	33·0	81·0	81·4	72·8
98·1	—	—	—	52·4	—	—	—	—	—	42·9	—	33·5	—	—	—	—	36·4	32·1	82·5	83·0	78·0
96·6	101·2	144·5	51·0	51·7	49·8	—	4·8	12·3	45·2	45·3	35·2	34·1	—	53·1	—	—	38·9	31·4	79·5	80·3	72·1
96·5	89·1	—	49·5	49·1	44·1	29·0	2·0	6·0	43·3	45·0	33·8	33·9	—	—	—	—	31·9	26·7	80·8	81·0	74·6
91·2	91·6	—	54·0	54·8	—	22·8	5·1	9·7	40·6	41·8	35·7	35·2	45·4	50·6	39·4	15·3	38·7	30·3	72·1	72·5	72·4
95·0?	93·1	121	50·5	49·3	48·1	26·0	5·1	13·0	41·4	41·2	30·9	31·1	46·9	49·6	39·7	12·2	32·7	—	—	—	72·8?
89·5	91·4	127	52·7	53·5	52·2	24·3	5·9	9·2	42·9	41·4	33·5	32·5	42·5	48·4	—	—	38·2	31·2	75·5	76·1	71·3
94·4?	93·4	129	46·3	46·2	45·1	23·5	3·8	8·2	39·1	39·4	31·5	32·1	41·6	45·5	—	—	37·9	29·5	81·7	81·7	75·1
97·2?	92·9	—	50·5	51·2	49·9	26·4	3·4	8·7	43·1	43·1	30·8	31·0	45·6	48·8	—	—	34·5	31·7	81·2	81·7	71·8
94·6?	92·4	—	48·2	49·1	47·2	22·5	5·4	12·3	42·8	41·1	32·4?	33·5	—	—	—	—	36·4	30·1	75·1?	75·7?	75·6
—	94·4	130	50·6	50·2	48·6	24·8	2·9	10·1	40·9	39·7	33·2	33·5	43·0	—	42·3	11·3	—	—	82·4	82·6	—
107·2?	—	—	53·8	52·8	52·1	26·3	6·2	9·3	—	44·2	32·4?	32·9	51·7	57·4	—	—	36·5	31·0	79·3	79·3	72·6
86·2	—	—	45·0	46·9	46·3	24·7	4·1	8·7	—	39·4	—	33·7	—	—	—	—	31·5	26·8	90·9	91·5	75·8
97·8	—	—	49·7?	50·1?	49·0	25·1	4·1	8·6	43·1	—	35·3	—	45·9	51·5	43·0	12·4	34·7	29·0	75·4	76·7	75·4
92·4	84·0	130	48·9	50·0	47·8	22·0	—	—	41·6	42·9	32·1	32·2	45·2	51·4	38·7	14·5	33·3	29·9	82·4	82·4	75·3
91·2?	91·0	—	41·1	41·0	40·0	25·8	3·5	10·8	39·5	39·9	29·5	28·7	43·6	48·7	—	—	31·1	25·9	83·3	83·3	73·8
92·1?	97·5	131·5	52·1	51·0	48·7	23·3	5·1	12·2	43·8	43·0	31·8	31·8	47·1	51·2	—	—	36·4	28·5	79·2	79·5	71·0
102·2	89·2	—	47·2	47·1	46·9	26·4	4·5	9·8	42·1	43·5	30·5	30·0	—	—	—	—	34·2	—	81·3	83·7	79·2
—	—	—	53·8	53·4	51·0	24·2	3·6	7·3	44·6	—	33·7	34·8?	41·3	44·5	—	—	—	—	81·4	81·4	—
96·3?	95·2?	131	51·7	52·1	48·8?	26·1	5·4	10·0	43·9?	43·9	33·8	33·9	47·6	51·2?	—	—	39·0	29·9	75·3	76·1	73·7
90·6	—	—	53·7	55·6	51·6	25·7	6·2	12·4	44·7	—	34·1	33·9	44·8	51·5	—	—	33·4	28·0	84·1	84·8	70·9
96·9?	93·5	128·5	51·8	51·5	50·1	25·1	5·5	11·2	42·1	41·7	32·5	32·5	47·1	52·8	44·1	11·6	31·1	28·0	77·6?	78·7?	75·6
94·0	93·4	124·5	47·8	47·7	46·0	25·1	3·5	8·0	43·4	42·2	32·9	32·6	—	—	—	—	32·3	—	80·6	81·0	74·3
—	85·8	—	52·5	52·5	47·3	22·6	4·1	10·0	41·2	41·5	30·6	30·7	43·8	48·4	40·8	9·0	—	—	83·3	84·1	—
87·4	—	132	45·9	45·8	43·3	24·5	2·5	8·2	—	40·1	31·2?	31·7	—	—	—	—	32·7	29·0	76·4	76·6	76·1
—	—	125	—	47·9	—	23·7	4·4	12·2	43·1	42·0	—	30·2	—	—	—	—	33·6	27·8	73·6	73·8	70·3
98·2?	—	—	46·5	45·0	—	—	—	—	38·9?	—	31·3?	—	—	—	—	—	31·7	28·2	—	—	75·4
84·7?	—	—	50·4	50·1	48·0	23·7	4·6	8·3	—	40·6	—	34·6	44·1	50·6	—	—	37·8	31·6	—	—	69·3
96·0?	—	130	51·6?	51·8?	—	24·5	6·8	11·7	42·0	42·0	32·5	33·0	44·5	48·6	—	—	—	—	76·0	76·0	74·3
100·4	—	137	49·1?	49·0	45·4	24·4	2·7	9·2	—	44·9	33·8?	32·0	48·3	52·5	—	—	33·4	28·7	—	—	74·6
97·3	85·5	—	49·8	51·2	46·9	23·0	4·3	9·5	41·1	41·5	32·5	33·0	44·8	47·7	39·4	9·9	32·0	27·4	—	—	74·3
87·2	92·0	117	—	—	—	—	—	—	—	—	33·9?	35·1	42·1	47·4	—	—	32·6	27·4	77·6	77·6	72·3
—	—	—	—	—	—	—	—	—	—	—	—	—	44·8	49·0	—	—	33·2	28·7	72·7?	73·1?	72·7
96·8	94·2?	128	53·5	53·4	51·1	26·0	6·8	10·3	44·8	43·0	34·0	33·7	42·7	46·9?	—	—	37·2	32·1	77·2	77·6	70·2
89·8?	—	139	—	—	—	27·0	—	—	—	—	—	—	43·4	47·9	—	—	34·3	30·8	—	—	—

rements of Spitalfields Skulls. II. *Male Skulls (cont.).*

100 $\frac{B}{F.V.L}$	100 $\frac{H'}{L}$	100 $\frac{H}{L}$	100 $\frac{H}{F.V.L}$	100 $\frac{B}{H'}$	100 $\frac{B}{H}$	100 $\frac{(B-H')}{L}$	*Oc. I.*	100 $\frac{fmb}{fml}$	100 $\frac{G'H}{GB}$	100 $\frac{NB}{NH'}$	100 $\frac{NB}{NH'}R$	100 $\frac{NB}{NH'}L$	100 $\frac{SS}{SC}$	100 $\frac{O_2}{O_1'}R$	100 $\frac{O_2}{O_1'}L$	100 $\frac{G_2}{G_1'}$	100 $\frac{G_2}{G_1'}$
83·5	75·1	75·6	76·3	110·3	109·5	7·7	66·4	78·7	—	61·5	57·6	58·8	21·6	—	71·1?	—	—
84·2	78·1	78·1	79·8	105·6	105·6	4·4	60·9	83·0	80·0	50·4	49·5	49·7	74·7	80·7	81·9	—	—
79·8	76·1	76·1	76·1	104·9	104·9	3·7	58·9	87·3	—	50·0	47·6	47·9	—	77·9	—	93·1	99·3
83·6	73·6	73·0	73·4	113·0	113·8	9·6	60·3	93·0	71·8	53·1?	50·7	49·8	37·7	75·2	75·4	—	—
76·5	69·9	69·3	69·5	109·2	110·0	6·4	60·2	81·6	71·8	46·0	47·9	47·7	20·0	73·5	73·1	79·1	87·3
87·8	78·1	78·4	79·1	111·4	110·9	8·9	63·8	86·8	72·2	—	51·8	51·6	—	80·2	80·6	87·1	94·8
75·6	71·9	71·9	72·5	104·2	104·2	3·1	57·7	84·6	—	55·2	53·6	51·8	33·3	81·9	81·9	—	—
78·4	73·7	72·6	72·8	106·1	107·7	4·5	56·0	86·4	73·0?	47·8	46·3	46·8	43·2	73·9	76·8	—	—
73·9	76·8	76·0	76·4	95·7	96·7	−3·3	57·9	82·9	66·2	58·4	56·2	56·7	61·0	67·8	73·5	—	—
79·2	76·1	75·8	75·8	104·1	104·4	3·1	58·4	—	70·1	47·3	46·4	48·6	40·0	77·0	82·6	—	—
—	70·8	70·3	70·3	—	—	—	57·7	83·1	73·0	55·7	51·8	52·2	37·5	78·6	78·1	86·6?	94·9?
72·4	71·1	70·3	70·5	101·5	102·7	1·1	59·4	83·3	78·8?	50·0	47·7	46·3	39·5	80·6	81·1	—	—
—	78·9	—	—	105·5	—	4·3	58·4	93·0	79·8	—	—	—	—	79·0	75·6	—	—
—	72·1	71·6	72·8	—	—	—	61·4	83·1	—	53·7	50·6	51·6	35·8	82·7?	82·3	—	—
76·4	70·5	70·0	71·0	106·8	107·7	4·8	59·0	78·7	79·8	54·2	51·0	50·3	27·7	80·8	83·0	—	—
80·1	76·7	77·6	77·8	104·1	103·0	3·2	65·4	84·9	75·7	50·6	48·7	48·7	70·8	82·4	80·2	—	—
81·4	72·8	72·0	72·4	111·2	112·5	8·2	59·2	85·7	75·3?	49·3	45·4	45·4	64·6	76·1	76·2	89·4	96·1
83·0	78·0	78·8	79·3	105·8	104·7	4·5	58·3	88·2	—	—	—	—	—	—	78·1	—	—
80·3	72·1	73·0	73·6	110·2	109·0	7·4	57·4	80·7	74·6	—	—	—	39·0	77·9	75·3	—	—
81·0	74·6	75·1	75·3	108·0	107·6	6·0	59·4	83·7	80·0	65·8	58·6	59·1	33·3	78·1	75·3	—	—
72·5	72·4	72·1?	72·5?	99·6	100·0?	−0·3	59·0	78·3	82·0?	—	41·1	40·1	52·6	87·9	84·2	77·9	86·8
—	72·8?	72·0?	72·0?	—	—	—	58·8	—	—	54·1	51·5	52·7	39·2	74·6	75·5	80·0	84·6
76·1	71·3	70·2	70·8	106·0	107·6	4·3	58·5	81·7	80·5	46·6	46·1	45·4	64·1	78·1	78·5	—	—
81·7	75·1	74·9	74·9	108·7	109·1	6·5	62·6	77·8	65·8?	52·1	50·8	50·9	46·3	80·6	81·5	—	—
81·7	71·8	71·3	71·7	113·1	114·0	9·4	60·9	91·9	75·0?	52·9	52·3	51·6	39·1	71·5	71·9	—	—
75·7?	75·6	75·9	76·6	99·3?	98·9?	−0·6?	59·5	82·7	73·6?	47·7	46·7	45·8	43·9	75·7?	81·5	—	—
82·6	—	—	—	—	—	—	59·3	—	76·3	51·0	49·0	49·4	28·7	81·2	84·4	—	98·4
79·3	72·6	72·6	72·6	109·4	109·4	6·8	56·3?	84·9	—	50·5	48·9	49·8	66·7	—	74·4	—	—
91·5	75·8	75·8	76·2	120·0	120·0	15·2	57·0	85·1	—	53·3	54·9	52·7	47·1	—	85·5	—	—
76·7	75·4	73·5	74·7	100·0	102·6	0·0	60·6	83·6	—	51·4	50·5?	50·1?	47·7	81·9	—	83·5	93·7
82·4	75·3	75·0	75·0	109·6	109·8	7·2	60·5	89·8	83·6	46·0	45·0	44·0	—	77·2	75·1	75·3	85·6
83·3	73·8	73·2	73·2	112·9	113·8	9·5	61·6	83·3	68·3?	64·5	62·8	62·9	32·4	74·7	71·9	—	—
79·5	71·0	70·8	71·0	111·5	112·0	8·2	58·6	78·3	73·6?	47·8	44·7	45·7	41·8	72·6	74·0	—	—
83·7	79·2	79·2	81·6	102·6	102·6	2·0	59·8	—	71·4	56·3	55·9	56·1	45·9	72·4	69·0	—	—
81·4	—	—	—	—	—	—	58·9	—	—	47·5	45·0	45·3	49·3	75·6	—	—	—
76·1	73·7	73·2	73·9	102·1	102·9	1·6	58·6	76·7	75·6?	53·5?	50·5	50·1	54·0	77·0?	77·2	—	—
84·8	70·9	69·8	70·4	118·7	120·5	13·2	56·9	83·8	—	49·8	47·9	46·2	50·0	76·3	—	—	—
78·7?	75·6	75·6	76·7	102·6?	102·6?	1·9?	58·6	90·0	74·9?	50·1	48·5	48·7	49·1	77·2	77·9	83·5	93·6
81·0	74·3	73·7	74·1	108·5	109·3	6·3	64·7	—	68·2	54·6	52·5	52·6	43·8	75·8	77·3	—	—
84·1	—	—	—	—	—	—	63·0	—	84·4	47·8	43·0	43·0	41·0	74·3	74·0	84·3	93·2
76·6	76·1	—	—	100·4	—	0·3	61·3	88·7	—	56·5	53·4	53·5	30·5	—	79·1	—	—
73·8	70·3	69·8	70·0	104·7	105·5	3·3	58·5	82·7	—	—	—	49·5	36·1	—	71·9	—	—
—	75·4	—	—	—	—	—	60·7	89·0	—	—	—	—	—	80·5?	—	—	—
—	69·3	—	—	—	—	—	58·7?	83·6	—	49·4	47·0	47·3	55·4	—	85·2	—	—
76·0	74·3	74·0	74·0	102·2	102·6	1·6	—	—	—	—	47·5?	47·3?	58·1	77·4	78·6	—	—
—	74·6	74·3	74·3	—	—	—	59·3	85·9	—	55·9	49·7?	49·8	29·3	—	71·3	—	—
—	74·3	—	—	—	—	—	61·7	85·6	75·1?	49·0	46·2	44·9	45·3	79·1	79·5	82·6	87·9
77·6	72·3	72·4	72·4	107·6	107·1	5·5	62·1	84·0	—	—	—	—	—	—	—	—	—
73·1?	72·7	72·7	73·1	100·0?	100·0?	0·0?	58·8	86·4	—	—	—	—	—	—	—	—	—
77·6	70·2	—	—	109·9	—	7·0	59·9?	86·3	73·2?	50·9	48·6	48·7	66·0	75·9	78·4	—	—
—	—	—	—	—	—	—	59·6	89·8	—	—	—	—	—	—	—	—	—

100 $\frac{SS}{SC}$	100 $\frac{O_2}{O_1}, R$	100 $\frac{O_2}{O_1}, L$	100 $\frac{G_2}{G_1}$	100 $\frac{G_2}{G_1'}$	100 $\frac{EH}{G_2}$	$N\angle$	$A\angle$	$B\angle$	*Alv.* $P\angle$	*Pros.* $P\angle$	θ_1	θ_2	
21·6	—	71·1?	—	—	—	65°·8	77°·5	36°·7	87°·8	85°·7	26°·4	10°·3	Sagittal suture closed, lambdoid clos
74·7	80·7	81·9	—	—	—	62°·8	71°·8	45°·4	83°·8	82°·2	33°·4	12°·8	Sagittal suture closing, lambdoid be
—	77·9	—	93·1	99·3	25·3	61°·9?	79°·1?	39°·0?	87°·8?	86°·0?	30°·3?	8°·7?	Ageing; sagittal suture partly oblite
37·7	75·2	75·4	—	—	—	70°·0	68°·9	41°·1	85°·0	84°·4	25°·0	16°·1	All sutures closing. Precondyle R.
20·0	73·5	73·1	79·1	87·3	28·5	69°·1	71°·1	39°·8	85°·0	83°·9	25°·9	13°·9	Aged; sagittal suture quite, coronal
—	80·2	80·6	87·1	94·8	29·6	64°·7	72°·8	42°·5	85°·1?	84°·8	30°·2?	12°·3?	Occipito-mastoid suture obliterated
33·3	81·9	81·9	—	—	—	67°·0?	72°·5?	40°·5?	82°·5	80°·4	30°·5?	10°·0?	Ageing; sagittal and coronal sutures
43·2	73·9	76·8	—	—	—	63°·3?	75°·1?	41°·6?	89°·6?	89°·0	27°·1?	14°·5?	Sagittal suture partly obliterated, co death.
61·0	67·8	73·5	—	—	—	67°·5	74°·5	38°·0	80°·0	78°·4	32°·5	5°·5	Sagittal suture closing. Ossicles at s
40·0	77·0	82·6	—	—	—	66°·0	71°·7	42°·3	79°·4	78°·0	34°·6	13°·4	Ageing; sagittal suture partly oblite present at death.
37·5	78·6	78·1	86·6?	94·9?	20·6?	68°·9	72°·2	38°·9	85°·0	83°·4	26°·1	12°·8	Ageing; sagittal suture partly oblite
39·5	80·6	81·1	—	—	31·2	65°·7?	72°·8?	41°·5?	84°·8	83°·8	29°·5?	12°·0?	Sagittal suture closing. Wormian in
—	79·0	75·6	—	—	—	63°·8	69°·4	46°·8	—	—	—	—	All sutures closing. Wormians in lan
35·8	82·7?	82·3	—	—	26·1	—	—	—	—	—	—	—	Sagittal suture closed, coronal and l
27·7	80·8	83·0	—	—	—	64°·4	71°·2	44°·4	83°·8	82°·9	31°·8	12°·6	Ageing; sagittal suture nearly oblite no 3rd molars; 1 carious tooth.
70·8	82·4	80·2	—	—	—	73°·3	68°·7	38°·0	79°·5	78°·5	27°·2	10°·8	Ageing; sagittal suture nearly oblite before death.
64·6	76·1	76·2	89·4	96·1	27·9	68°·5?	68°·4?	43°·1?	83°·8?	81°·5	27°·7?	15°·4?	All sutures closing. Wormian in lam
—	—	78·1	—	—	—	64°·8	74°·1	41°·1	82°·0?	81°·1	33°·2?	7°·9?	Sagittal and lambdoid sutures closin
39·0	77·9	75·3	—	—	—	63°·8	71°·8	44°·4	86°·0	84°·9	30°·2	14°·2	Sagittal suture closed, coronal and
33·3	78·1	75·3	—	—	—	69°·0	67°·5	43°·5	—	—	—	—	Sagittal suture partly obliterated, la
52·6	87·9	84·2	77·9	86·8	38·8	60°·0?	74°·5?	45°·5?	84°·9?	84°·5	35°·1?	10°·4?	Aged; all sutures nearly obliterated
39·2	74·6	75·5	80·0	84·6	30·7	—	—	—	—	—	—	—	Sagittal suture closing. Teeth worn
64·1	78·1	78·5	—	—	—	59°·7	75°·1	45°·2	87°·2	85°·0	33°·1	12°·1	Sagittal suture closed, lambdoid an
46·3	80·6	81·5	—	—	—	67°·9?	74°·9?	37°·2?	85°·5	83°·8	26°·6?	10°·6?	All sutures closing. Wormians in la
39·1	71·5	71·9	—	—	—	66°·2?	72°·8?	41°·0?	89°·1?	87°·8	24°·7?	16°·3?	Ageing; sagittal and coronal sutures angles of mandible.
43·9	75·7?	81·5	—	—	—	63°·6?	76°·4?	40°·0?	85°·4?	84°·4	31°·0?	9°·0?	Ageing; sagittal and coronal suture most present at death.
28·7	81·2	84·4	—	98·4	26·7	—	—	—	84°·9	84°·0	—	—	Sagittal suture closing. Wormians i
66·7	—	74·4	—	—	—	70°·4?	71°·5?	38°·1?	—	79°·4	—	—	Aged; sagittal suture quite, coronal
47·1	—	85·5	—	—	—	63°·7	74°·5	41°·8	84°·9	83°·8	31°·4	10°·4	Ageing; sagittal suture nearly oblit
47·7	81·9	—	83·5	93·7	28·8	66°·2	75°·4	38°·2	79°·9?	77°·5?	33°·9?	4°·5?	Sagittal suture closing. Wormians i
—	77·2	75·1	75·3	85·6	37·5	63°·4	73°·8	42°·8	85°·3	84°·0	31°·3	11°·5	Ageing; sagittal suture nearly oblit
32·4	74·7	71·9	—	—	—	69°·5?	70°·9?	39°·6?	89°·0?	87°·8	21°·5?	9°·1?	Ageing; sagittal suture partly oblit
41·8	72·6	74·0	—	—	—	62°·0?	74°·6?	43°·4?	—	—	—	—	Ageing; sagittal suture nearly oblit
45·9	72·4	69·0	—	—	—	71°·2	72°·6	36°·2	79°·4?	78°·4	29°·4?	6°·8?	Ageing; sagittal suture nearly oblit
49·3	75·6	—	—	—	—	—	—	—	94°·5?	—	—	—	Ageing; sagittal suture obliterated,
54·0	77·0?	77·2	—	—	—	62°·8?	75°·7?	41°·5?	87°·8?	87°·5	29°·5?	12°·1?	Aged; all sutures nearly obliterated
50·0	76·3	—	—	—	—	58°·8	77°·5	43°·7	94°·3?	93°·0	27°·9?	16°·8?	Ageing; all sutures nearly closed. W death.
49·1	77·2	77·9	83·5	93·6	26·3	65°·5?	73°·5?	41°·0?	85°·1?	84°·6	29°·4?	11°·6?	All sutures closing. Wormian in lan
43·8	75·8	77·3	—	—	—	63°·8	78°·9	37°·3	88°·5?	87°·6	27°·7?	9°·6?	Aged; all sutures nearly obliterated
41·0	74·3	74·0	84·3	93·2	22·1	—	—	—	88°·2	86°·8	—	—	Sagittal and coronal sutures closing
30·5	—	79·1	—	—	—	61°·0	80°·9	38°·1	87°·0	86°·8	32°·0	6°·1	Aged; all sutures obliterated. J=.
36·1	—	71·9	—	—	—	—	—	—	—	—	—	—	Aged; all sutures nearly obliterated
—	80·5?	—	—	—	—	70°·8?	70°·4?	38°·8?	—	—	—	—	Sagittal suture closing. Wormian in
55·4	—	85·2	—	—	—	59°·8?	72°·7?	47°·5?	—	—	—	—	Wormians in lambdoid suture L.
58·1	77·4	78·6	—	—	—	63°·6?	74°·2?	42°·2?	84°·5?	83°·4	31°·9?	10°·3?	Ageing; all sutures closed. *Os épac*
29·3	—	71·3	—	—	—	71°·7	67°·0	41°·3	78°·5	77°·6	29°·8	10°·6	Sagittal suture closing. Wormians i
45·3	79·1	79·5	82·6	87·9	25·1	67°·7?	74°·7?	37°·6?	—	—	—	—	Sagittal suture closing, coronal and
—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal and lambdoid sutu
—	—	—	—	—	—	—	—	—	86°·7	84°·5	—	—	All sutures closing. J=. Several te
66·0	75·9	78·4	—	—	—	62°·3?	78°·4?	39°·3?	89°·8	88°·8	27°·9?	11°·4?	Aged; sagittal and lambdoid suture
—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture closed, lambdoid cl

Remarks

ed, lambdoid closing. Wormians in lambdoid R. and L. JL. Several teeth lost before death.
ing, lambdoid beginning to close. Precondyle L. J=. Teeth worn and 5 lost before death.
ture partly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. J=. Teeth worn but none lost bef
Precondyle R. JR. Healed fracture of zygomatic arch L. and wound on frontal bone. Teeth worn and 3 lost befo
re quite, coronal and lambdoid partly obliterated. Metopic suture closed, LF+RP. JR. Teeth considerably worn b
ture obliterated R.; all other sutures open. Epipteric bone L. Tympanic perforation L. JL. Asymmetrical. Teeth har
d coronal sutures partly obliterated, lambdoid closing. Epipteric bone R. JR. Depression at obelion. Teeth worn
ly obliterated, coronal and lambdoid beginning to close. Wormians in lambdoid R. and L. JR. Small epipteric bon

ing. Ossicles at asteria. Epipteric bone L. JR. 8 or more teeth present at death, teeth worn.
ture partly obliterated, coronal closing, lambdoid beginning to close. Wormians in lambdoid R. and L. Depression at
n.
ture partly obliterated, lambdoid closing. Wormian in lambdoid L. J=. Teeth worn but none lost before death. Palat
ing. Wormian in lambdoid L. JR. Teeth slightly worn and none lost before death.
Wormians in lambdoid R. and L. Epipteric bone L. Teeth worn and 3 carious; 13 or more present at death.
ed, coronal and lambdoid closing. Metopic RF+LP 2·5 mm. J=. Teeth worn; P_1R the only tooth lost before death
ture nearly obliterated, coronal closed, lambdoid nearly closed. Asymmetrical. Fronto-temporal articulation L. Tee
1 carious tooth. JR.
ture nearly obliterated; coronal and lambdoid nearly closed. Wormians in lambdoid R. and L. Large median precon

. Wormian in lambdoid R. Teeth worn; 5 lost from upper jaw before death. Mandible, 7 teeth lost before death. J
loid sutures closing. Wormians in lambdoid L. Large epipteric bone L. Teeth worn; most of the teeth present at de
sed, coronal and lambdoid closing. Wormians in lambdoid R. and L. JR. Teeth worn; 3 lost before death; 1 cariou
tly obliterated, lambdoid closing. Wormians in lambdoid R. Small precondyles. JR. No teeth lost before death (?)
nearly obliterated. Teeth moderately worn and none lost before death; 1 carious molar.
sing. Teeth worn but none lost before death.
sed, lambdoid and coronal closing. JR. Teeth worn but none lost before death; 1 carious.
. Wormians in lambdoid R. and L. Small epipteric bone R. J=. Teeth worn and 3 lost before death.
d coronal sutures nearly obliterated, lambdoid closed. JR. Asymmetrical. Mandible; teeth worn; 6 molars lost fr
ible.
nd coronal sutures partly obliterated, lambdoid nearly closed. Asymmetrical foramen magnum. Low median sagitt
t death.
sing. Wormians in lambdoid R. and L. Teeth moderately worn and only 1 incisor lost before death.
ure quite, coronal and lambdoid nearly obliterated. JR. Palatine torus. Teeth worn and 3 or more lost before deat
ture nearly obliterated, coronal closing, lambdoid open. Wormians in lambdoid L. JR.
sing. Wormians in lambdoid R. and L. JR. Jugular foramen L. divided. Teeth worn but none lost before death; n
ture nearly obliterated, coronal and lambdoid closing. Double ossicle of λ and ossicles at asteria. JL. No teeth lost
ture partly obliterated, coronal and lambdoid beginning to close. Wormians in lambdoid R. JL. Teeth worn but n
ture nearly obliterated, lambdoid partly obliterated, coronal closing. JR. Some teeth lost before death and several
ture nearly obliterated, coronal and lambdoid nearly closed. Epipteric bone L. Asymmetrical. Teeth worn and mos
ture obliterated, coronal and lambdoid nearly closed. Most of the teeth present at death.
nearly obliterated. Wormians in lambdoid R. and L. JR. Teeth worn but none lost before death.
s nearly closed. Wormians in lambdoid R. and L. Large epipteric bone L. JR. Precondyles; large R., small L. Teeth

g. Wormian in lambdoid R. Small epipteric bone R. Tympanic perforation R. and L. J=. No teeth lost before deat
nearly obliterated. Teeth worn; 2 or more lost before death.
nal sutures closing. Wormians in lambdoid R. and L. Ossicle of λ. Ossicle of bregma. Metopic. No teeth lost before
obliterated. J=. Teeth worn; 10 or more present at death.
nearly obliterated. Wormians in lambdoid R. and L. Ossicles at asteria. Small epipteric bone L. JL.
sing. Wormian in lambdoid L. Teeth worn but probably none lost before death.
bdoid suture L. Large ossicle of λ asymmetrically placed. Slight tympanic perforation L. No teeth lost before deat
es closed. *Os épactal*. Ossicle of bregma. JR. Mandible; teeth worn but probably all present at death; small upper
sing. Wormians in lambdoid R. Tympanic perforation R. JR. Teeth worn; 2 carious and 1 molar lost before death.
sing, coronal and lambdoid beginning to close. Precondyle R. No teeth lost before death; no 3rd molars.
nd lambdoid sutures nearly obliterated, coronal closed. JL. Teeth worn; 10 present at death, 1 carious.
g. J=. Several teeth lost before death.
d lambdoid sutures obliterated, coronal closed. JR. Most of the teeth present at death, 1 premolar carious.
osed, lambdoid closing. Wormians in lambdoid R. and L. Ossicle of λ. Ossicle in sagittal above λ. JR. Teeth worn b

th lost before death.
lost before death.
ɔdoid R. J=. Teeth worn but none lost before death.
ɔn frontal bone. Teeth worn and 3 lost before death.
, LF+RP. JR. Teeth considerably worn but none lost before death.
erforation L. JL. Asymmetrical. Teeth hardly worn and none lost before death.
t. JR. Depression at obelion. Teeth worn but none lost before death.
nbdoid R. and L. JR. Small epipteric bone L. Teeth worn but none lost before

at death, teeth worn.
rmians in lambdoid R. and L. Depression at obelion. Teeth worn and 11 or more

Teeth worn but none lost before death. Palatine torus. Low median sagittal ridge.
fore death.
arious; 13 or more present at death.
worn; P_3R the only tooth lost before death.
trical. Fronto-temporal articulation L. Teeth worn but none lost before death;

lambdoid R. and L. Large median precondyle. JL. Teeth worn but none lost

th. Mandible, 7 teeth lost before death. JR.
eeth worn; most of the teeth present at death. JR.
t. Teeth worn; 3 lost before death; 1 carious.
ndyles. JR. No teeth lost before death (?).
carious molar.

death; 1 carious.
worn and 3 lost before death.
al. Mandible; teeth worn; 6 molars lost from both jaws before death. Everted

rical foramen magnum. Low median sagittal ridge. J=. Teeth moderately worn;

1 incisor lost before death.
Teeth worn and 3 or more lost before death.
ıbdoid L. JR.
. Teeth worn but none lost before death; no 3rd molars.
λ and ossicles at asteria. JL. No teeth lost before death.
ians in lambdoid R. JL. Teeth worn but none lost before death.
. Some teeth lost before death and several carious.
ne L. Asymmetrical. Teeth worn and most of them present at death.
present at death.
none lost before death.
JR. Precondyles; large R., small L. Teeth worn and several molars lost before

R. and L. J=. No teeth lost before death.

of bregma. Metopic. No teeth lost before death, no 3rd molars.

Small epipteric bone L. JL.
death.
ic perforation L. No teeth lost before death.
probably all present at death; small upper 2nd incisors.
n; 2 carious and 1 molar lost before death.
ost before death; no 3rd molars.
10 present at death, 1 carious.

sent at death, 1 premolar carious.
sicle in sagittal above λ. JR. Teeth worn but none lost before death.

No.	Sex	C	IOW	B′	B″	B	Biasterionic B	F	F.V.L	L	H′	H	OH
5	♂	—	95·5	101·1	122·5	141	113	191	—	194	140·5	—	—
10	♂?	—	—	—	—	134·5	106	178	177	180	131·5	133	109
29	♂	1555	—	96·1	118·5	147·5	110	176·5	182	182	147·5	147	121·5
34	♂?	—	—	—	129·5?	141	104·5	180	—	178?	130	—	—
39	,,	—	98·5	95·0	—	146	113	174	175?	177	128	129	110·5
58	,,	—	97	101·0	—	—	—	189	—	—	—	—	—
86	,,	—	94·5	95·0	113?	—	—	—	—	—	—	—	—
100	♂	1459	96	97·8	123	144	119	177·5	179	179	131	131·5	114·5
103	♂?	—	97	100·2	—	147	107	181	182	182	136	136	119·5
108	,,	—	96	96·9	129	150	—	177	178	179	130	130·5	113
110	,,	—	95·5	88·8	113?	135	114·5	169	—	171	—	—	—
116	,,	—	102	102·1	—	152	111	182	—	184·5	137	—	—
118	♂	—	—	95·2	121·5?	145·5	116	184·5	189	189·5	135	135	118
127	♂?	—	100·5?	101·6	—	149	109	175·5	—	175	—	—	—
129	,,	—	96	93·9	119	145	—	169	—	173?	124·5	—	—
135	,,	—	—	—	—	—	—	—	—	172	—	—	—
136	,,	—	—	96·7	—	—	—	180	182·5	182·5	124?	123·5	111
137	,,	—	—	—	—	146	110	—	—	—	126·5	126	109·5
138	,,	—	100	104·0	—	—	108	179	—	181	—	—	—
202	♂	—	97	96·1	130·5	147·5	—	174·5	175·5	177	144	142	119·5
216	♂?	—	102	101·3	127?	140	—	179·5	180	180	129	129·5	118
224	,,	—	96	95·0	124	143	109	171·5	174	174	—	—	114·5
228	,,	—	100	102·0	127?	140	—	182	—	183	—	—	—
324	,,	—	93	95·0	—	137·5	—	189	—	190·5	—	—	—
326	,,	—	102?	104·1	—	149	—	181·5	—	185?	—	—	—
355	,,	—	—	—	—	139·5?	110·5	169	170	171	130	128	113
358	,,	—	96·5	95·8	—	141	—	172·5	—	—	—	—	—
371	,,	—	—	103·7	—	—	—	179·5	—	185	—	—	—
409	,,	1358	97	95·2	117·5	147·5	98	187·5	—	189	125·5	—	—
410	♂	1470	—	100·2	121·5	141	—	177	—	181	131	—	—
412	,,	—	97	95·5	125	145	113	187	188·5	190	136	136·5	122·5
413	,,	1440	102	104·8	128?	145	—	186	190	190	127	127	108
415	♂?	1298	97	91·3	115·5	134·5	108	179	176	180	126·5	125·5	105·5
424	,,	—	99·5	100·2	121?	146	115	—	177?	180?	125·5	125·5	110·5
426	♂	—	102	97·1	114	142	115·5	168	172	172	133?	138·5?	123
443	♂?	—	—	—	—	139·5	—	181	—	185?	143	—	—
446	,,	—	97	88·9	—	—	—	169·5	—	172	—	—	—
491	,,	—	—	—	—	—	—	171	—	173	—	—	—
507	,,	1225	95·5	96·2	119?	139	105	176·5	180	180	125	124	111
538	,,	—	—	89·9	117	136	—	172	173·5	177	131	132·5	109·5
552	,,	—	94·5	97·3	—	—	—	—	—	—	—	—	—
615	,,	—	97	100·1	123·5	143	—	181	179·5	181	135	136	114·5
616	,,	1382	101	103·8	—	145	—	180·5	181·5	183	134	134	118
619	,,	1370	94	94·8	122·5	144	111	179·5	179·5	181	124·5	123·5	109·5
635	♂	—	101·5	97·1	121·5	144	117	188·5	—	194	—	—	—
647	♂?	—	97	96·2	115·5?	134	—	177·5	181·5	182	128	127	114
654	,,	—	93	89·8	—	—	—	171	—	171	—	—	—
656	,,	—	—	—	—	—	—	—	—	—	—	—	—
668	,,	—	94·5	93·3	120·5	138	—	—	—	—	—	—	—
701	,,	1263	105	102·1	—	152	—	166·5	169·5	171	132	132	111·5
702	♂	—	97?	92·1	—	140·5	113	173·5	180	180	—	—	114·5
706	♂?	1530	—	97·3	126	147	—	184	185·5	185·5	137·5	137·5	120
730	,,	—	—	—	—	—	—	—	—	174	126	—	—
826	♂	—	96·5	96·0?	125·5	141	110·5?	—	171·5	172·5	125	125	110·5
841	♂?	—	92·5	85·3	—	—	—	177	—	183	—	—	—
851	,,	—	—	—	—	—	—	—	—	—	135	—	—

H′	*H*	*OH*	*Bregmatic OH*	*LB*	S_1'	S_2'	S_3'	S_1	*S*	S_2	*S*	*U*	*Broca's Q′*	*Q′*	*Bregmatic Q′*
140·5	—	—	—	109·1	114·8	117·8	97·1	134	132	120	386	537	311	—	320
131·5	133	109	108·5	99·4	106·5	105·1	96·0	123	116·5	120	359	—	284	298	297?
147·5	147	121·5	121	102·4	115·3	122·1	104·6	128	137·5	118·5	384	507	320	330	330·5
130	—	—	—	—	—	110·6	93·4	—	129·5	110	—	—	305	—	313
128	129	110·5	112	—	—	103·8	92·0	—	115	110·5	—	511	304	313	310
—	—	—	—	—	110·4	123·1	—	125·5	134·5	—	—	—	—	—	—
—	—	—	—	—	115·1	—	—	131	—	—	—	—	—	—	—
131	131·5	114·5	113·5	92·9	106·1	115·6	98·4	124·5	129	117	370·5	517	303	314	313
136	136	119·5	119	103·2	113·0	112·7	99·1	130·5?	127·5	115	373?	527	322	330	326
130	130·5	113	114	95·4	110·5	118·7	89·1	125·5	136	105	366	518	—	322	319?
—	—	—	—	—	108·2	103·2	97·2	119·5	113	113	345·5	487	293	—	299
137	—	—	—	101·3	117·2	114·2	95·8	—	129	116	—	531	325	—	334
135	135	118	118	100·2	110·9	116·1	100·0	136	129?	120	385?	527	314	323	322
—	—	—	—	101·9	—	—	95·8	—	—	115	—	517?	—	—	—
124·5	—	—	—	—	—	107·8	92·5	—	122·5	115	—	504	308	—	314·5
—	—	—	—	—	113·0	107·7	94·1	127	120·5	111	358	—	—	—	—
124?	123·5	111	111	101·3	107·9?	110·8?	91·9	127?	123?	117·5	367	—	—	—	—
126·5	126	109·5	109·5	—	—	96·8	90·0	—	108·5	107	—	—	308	318	315
—	—	—	—	—	119·1	111·5	90·9	136·5	123	112	371·5	—	—	—	—
144	142	119·5	120	103·3	115·5	111·3	91·3	134	127	105	367	511	317·5	333·5	329·5
129	129·5	118	116	98·8	109·6	111·1	97·7	129	122·5	118	369	518	310	324	322
—	—	114·5	114	—	109·0	113·1	89·9	127	128	106	361	502	303	313	313
—	—	—	—	—	118·0	119·5	93·3	134	137	108	379	—	—	—	—
—	—	—	—	—	117·2	118·4	103·0	134	131	127·5	392	—	—	—	—
—	—	—	—	—	108·0	111·6	—	119·5	122	—	—	—	—	—	—
130	128	113	114	98·2	108·1	104·2	93·5	125	113·5	112	351	—	—	311?	—
—	—	—	—	—	108·2	106·0	—	124·5	118	—	—	—	—	—	—
—	—	—	—	—	120·7	114·0	88·1	139	130·5	109	379	—	—	—	—
125·5	—	—	—	99·1	114·6	113·3	88·8	132	129	110	371	530	303	—	312·5
131	—	—	—	96·9	108·5	114·1	97·7	124	129	121·5	375	519	301	—	312
136	136·5	122·5	119·5	101·0	116·6	115·8	102·9	133·5	131	125	390	533	314	325	322
127	127	108	108	101·2	109·3	114·5	95·7	125·5	127·5	120	373	534	303	313·5	311
126·5	125·5	105·5	105·5	99·2	104·5	107·9	89·2	119	117·5	113	350	506	277	292·5	290
125·5	125·5	110·5	110·5	89·8	108·1	118·0	86·8	126	134?	110	370?	523?	301	312	311
133?	138·5?	123	116	102·2?	99·0	111·1	—	106	129·5	—	—	500	—	328·5	313
143	—	—	—	113·2?	118·0	110·2	101·6	—	124·5	114	—	—	305	—	318
—	—	—	—	—	101·0	95·1	—	114·5	109	—	—	—	—	—	—
—	—	—	—	—	108·1	112·5	94·1?	121·5	128	110?	359	—	—	—	—
125	124	111	111·5	97·5	116·0	112·4	91·0	132	123	113	367	510	293	305	304
131	132·5	109·5	107·5?	103·3	104·0	107·1	90·8	117	121	107·5	345	—	290	301	299
—	—	—	—	—	111·0	—	—	131	—	—	—	—	—	—	—
135	136	114·5	114·5	101·9	113·7	109·4	98·9	129·5	121·5	115	367	520	303?	318	315?
134	134	118	117·5	98·1	113·1	116·8	96·1	130·5	129	119	378	522	315	323	323
124·5	123·5	109·5	109	96·1	110·7	111·9	94·9	129	124·5	117	370	517	302	313	313
—	—	—	—	—	117·6	110·8	—	132·5	121·5	—	—	535	—	—	—
128	127	114	112·5	99·1	112·8	112·8	90·0	125·5	125	110	361	510	293	305	305
—	—	—	—	—	110·7	105·0	91·0	127	117·5	107	351	—	—	—	—
—	—	—	—	—	113·6	102·0	—	129	112	—	—	—	—	—	—
—	—	—	—	—	106·3	106·1	—	120	120?	—	—	—	—	—	—
132	132	111·5	111	99·2	112·1	107·5	92·9	126	122·5	103	352	511	317	327	327
—	—	114·5	110·5	—	109·3	105·9	102·2	122	119	117·5	358	508	305	317	313
137·5	137·5	120	118·5	103·9	114·0	118·6	95·3	128	134·5	116·5	379	528	318	329	328
126	—	—	—	99·8	105·5?	104·6	95·7	—	115·5	119	—	—	—	—	—
125	125	110·5	110	103·9	107·9?	101·0	88·7	120?	111	107	339?	495?	302	311	312
—	—	—	—	—	116·6	103·2	95·1	131	113	116·5	361	—	—	—	—
135	—	—	—	—	—	111·1	96·4	—	125?	113	—	—	—	—	—

Q'	*Bregmatic Q'*	*G'H*	*GB*	*J*	*NH, R*	*NH, L*	*NH'*	*NB*	*SS*	*SC*	*O_1R*	*O_1L*	*O_2R*	*O_2L*	*G_1'*	*G_1*	*G_2*	*EH*	*fml*	*fmb*
—	320	—	—	—	—	—	—	—	5·0	9·9	—	—	—	—	—	—	—	—	38·0	32·6
298	297?	—	—	—	—	—	—	—	—	—	—	—	32·1?	—	—	—	—	—	34·3	29·4
330	330·5	—	—	—	—	—	—	—	—	—	—	—	34·4?	—	—	—	—	—	33·7	28·1
—	313	—	—	130	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31·2	30·6
313	310	—	—	129	—	—	—	—	—	—	—	—	—	34·7?	—	—	—	—	34·0	26·5
—	—	63·9	92·9	—	48·7	48·4	46·2	28·1	4·2	10·2	41·8	40·3	32·1	32·0	47·8	50·9	41·5	11·9	—	—
—	—	—	—	—	—	—	—	—	4·5	8·1	—	—	—	—	—	—	—	—	—	—
314	313	—	92·9	134	48·5	48·0	46·1	24·5	4·0	11·8	41·5	38·7	30·9	31·7	41·5	44·8	—	—	36·9	31·9
330	326	—	—	132·5	—	—	—	—	—	—	—	—	36·8	—	—	—	—	—	38·1	32·5
322	319?	—	—	—	—	—	—	—	—	—	—	—	—	31·6	—	—	—	—	37·1	30·8
—	299	—	—	129	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	334	—	—	136	—	—	—	—	—	—	—	—	—	—	—	—	—	—	36·8	32·0
323	322	—	—	—	—	—	—	—	5·4	7·6	—	—	—	—	—	—	—	—	37·5	29·9
—	—	—	—	—	—	—	—	—	5·7	12·2	—	—	—	—	—	—	—	—	35·4	—
—	314·5	—	—	128	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30·7	27·1
—	—	—	—	—	—	—	—	—	4·8	9·2	—	41·9	—	31·8	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	31·0?	—	—	—	—	29·8	29·3
318	315	—	—	138?	—	—	—	—	—	—	—	—	30·7	—	—	—	—	—	31·0	30·0
—	—	—	—	—	—	—	—	—	4·9	10·0	—	42·8	31·8?	31·7	—	—	—	—	—	—
333·5	329·5	—	96·5?	139	—	—	—	25·1	3·7	9·8	41·2	42·5	31·2	31·5	—	—	—	—	37·9	34·1
324	322	—	—	—	—	—	—	—	—	—	—	—	34·9	—	—	—	—	—	33·9	27·4
313	313	—	—	—	49·5	51·1	50·4	25·0	3·8	8·8	—	39·8	—	32·3?	—	—	—	—	—	—
—	—	71·2?	—	—	51·0	51·0	51·0	—	—	—	—	—	—	—	44·4	49·9	37·9	14·4	—	—
—	—	67·5	—	—	—	—	49·0	—	—	—	42·0	—	32·4	—	—	—	—	—	—	—
—	—	78·0	—	—	53·8	55·2	53·7	27·2	5·1	11·0	—	—	33·2?	35·5?	47·2	51·4	—	—	—	—
311?	—	—	—	—	—	—	—	—	—	—	41·7?	—	33·0	—	—	—	—	—	32·9	28·0
—	—	—	—	—	46·9	46·9	44·0	23·0	4·7	11·1	41·7	—	33·4	—	43·2?	48·1	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	45·0	—	36·2	—	—	—	—	—	—
—	312·5	—	—	—	—	—	—	—	—	—	—	42·5	—	—	—	—	—	—	36·2	28·5
—	312	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37·2	27·7
325	322	—	—	—	49·2	—	—	—	—	—	43·4	—	30·4	—	—	—	—	—	35·5	28·9
313·5	311	—	—	—	—	47·0	—	—	—	—	—	42·2	—	35·0	—	—	—	—	35·8	28·9
292·5	290	—	—	—	—	—	—	—	—	—	—	—	—	32·5	—	—	—	—	36·6	29·8
312	311	—	89·0	130	45·1	45·2	44·2	23·7	—	—	—	42·3	35·3	32·2	43·0?	46·8?	41·9	10·5	33·9	30·7
328·5	313	—	92·9?	130·5	44·9	46·1	44·1	23·0	8·0	14·8	42·5	43·8	31·5	31·1	—	—	—	—	—	—
—	318	70·0?	—	—	50·1	49·9	49·0	22·1	—	—	—	—	—	—	—	51·5	—	—	38·3?	33·7
—	—	—	91·6	—	47·0	47·7	—	23·8	3·1	7·1	41·4	42·5	34·9	35·5	47·0	50·4	41·2	10·8	—	—
—	—	68·2?	—	—	—	50·8	—	—	—	—	—	41·8	—	34·5	—	—	—	—	—	—
305	304	—	92·4	124·5	47·8	49·0	47·3	23·9	3·6	8·3	43·3	42·8	34·0	33·0	46·2	50·6	—	—	32·3	27·7
301	299	—	—	127	—	—	—	—	—	—	—	39·2	—	—	—	—	—	—	36·1	31·1
—	—	—	—	—	—	—	—	—	3·5	8·1	—	—	—	—	—	—	—	—	—	—
318	315?	—	—	128·5	—	—	—	22·3	3·6	8·0	42·5	42·8	—	36·7	—	—	—	—	36·1	29·4
323	323	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	31·0	27·9
313	313	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32·2	27·5
—	—	72·8	99·6	—	51·1	51·1	—	27·0	3·8	7·6	43·9	44·5	33·9	33·0	—	—	—	—	—	—
305	305	—	—	125	47·9	—	—	23·7	4·4	12·2	—	41·6	30·8	30·1	—	—	—	—	33·6	27·8
—	—	71·8	98·4	—	53·9	55·1	51·1	28·2	5·4	10·2	40·4	41·1	33·7	32·1	44·5	50·9	—	—	—	—
—	—	68·8?	—	—	—	50·4	—	—	4·3	10·9	—	39·2	—	33·0	—	—	—	—	—	—
—	—	71·2	93·0	—	52·1	—	—	—	3·8	6·6	42·5	41·5	33·1	33·0	—	—	—	—	—	—
327	327	—	—	—	—	—	—	—	6·0?	10·2?	—	44·6	—	34·4	—	—	—	—	38·2	32·9
317	313	—	—	—	—	—	—	—	—	—	41·9	—	—	—	—	—	—	—	—	—
329	328	—	—	—	—	52·4	50·1?	—	3·8?	7·2?	—	41·9	—	30·7	—	—	—	—	35·6	31·7
—	—	—	—	—	—	—	—	—	—	—	41·4	—	33·7	—	—	—	—	—	30·7	26·4
311	312	—	—	—	—	—	—	—	—	—	—	42·5	—	32·1	—	—	—	—	38·1	—
—	—	73·5?	—	—	54·9	56·7	54·9	25·4	4·2	7·3	41·5	—	33·6	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	30·7	—	—	—	—	—	34·8	31·0

EH	*fml*	*fmb*	100 $\frac{B}{L}$	100 $\frac{B}{F.V.L}$	100 $\frac{H'}{L}$	100 $\frac{H}{L}$	100 $\frac{H}{F.V.L}$	100 $\frac{B}{H'}$	100 $\frac{B}{H}$	100 $\frac{(B-H')}{L}$	*Oc. I.*	100 $\frac{fmb}{fml}$	100 $\frac{G'H}{GB}$	100 $\frac{NB}{NH'}$	100 $\frac{NB}{NH'}\,R$	100 $\frac{NB}{NH'}\,L$	1 $\frac{S}{S}$
—	38·0	32·6	72·7	—	72·4	—	—	100·4	—	0·3	57·7	85·7	—	—	—	—	5
—	34·3	29·4	74·7	76·0	73·0	73·9	75·1	102·3	101·1	1·7	57·1	85·7	—	—	—	—	—
—	33·7	28·1	81·0	81·0	81·0	80·0	80·8	100·0	100·3	0·0	67·5	83·4	—	—	—	—	—
—	31·2	30·6	79·2?	—	73·0?	—	—	108·5	—	6·2?	61·9	98·1	—	—	—	—	—
—	34·0	26·5	82·5	83·4?	72·3	72·9	73·7?	114·1	113·2	10·2	59·9	77·9	—	—	—	—	—
11·9	—	—	—	—	—	—	—	—	—	—	—	—	68·8	60·8	57·7	58·1	4
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5
—	36·9	31·9	80·4	80·4	73·2	73·5	73·5	109·9	109·5	7·3	60·9	86·4	—	53·1	50·5	51·0	3
—	38·1	32·5	80·8	80·8	74·7	74·7	74·7	108·1	108·1	6·0	63·8	85·3	—	—	—	—	—
—	37·1	30·8	83·8	84·3	72·6	72·9	73·3	115·4	114·9	11·2	61·9	83·0	—	—	—	—	—
—	—	—	78·9	—	—	—	—	—	—	—	63·4	—	—	—	—	—	—
—	36·8	32·0	82·4	—	74·3	—	—	110·9	—	8·1	59·2	87·0	—	—	—	—	—
—	37·5	29·9	76·8	77·0	71·2	71·2	71·4	107·8	107·8	5·5	60·0	79·7	—	—	—	—	7
—	35·4	—	85·1	—	—	—	—	—	—	—	60·0	—	—	—	—	—	4
—	30·7	27·1	83·8?	—	72·0?	—	—	116·5	—	11·8?	57·4	88·3	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	61·7	—	—	—	—	—	5
—	29·8	29·3	—	—	67·9?	67·7	67·7	—	—	—	55·9	98·3	—	—	—	—	—
—	31·0	30·0	—	—	—	—	—	115·4	115·9	—	61·0	96·8	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	57·9	—	—	—	—	—	4
—	37·9	34·1	83·3	84·0	81·4	80·2	80·9	102·4	103·9	2·0	65·0	90·0	—	—	—	—	4
—	33·9	27·4	77·8	77·8	71·7	71·9	71·9	108·5	108·1	6·1	59·4	82·3	—	—	—	—	—
—	—	—	82·2	82·2	—	—	—	—	—	—	61·8	—	—	49·6	50·5	48·9	4
14·4	—	—	76·5	—	—	—	—	—	—	—	64·0	—	—	—	—	—	—
—	—	—	72·2	—	—	—	—	—	—	—	57·6	—	—	—	—	—	—
—	—	—	80·5?	—	—	—	—	—	—	—	—	—	—	50·7	50·6	49·3	4
—	34·9	28·0	81·6?	82·1?	76·0	74·9	75·3	107·3?	109·0?	5·6?	60·2	85·1	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	52·3	49·0	49·0	4
—	—	—	—	—	—	—	—	—	—	—	57·7	—	—	—	—	—	—
—	36·2	28·5	78·0	—	66·4	—	—	117·5	—	11·6	57·6	78·7	—	—	—	—	—
—	37·2	27·7	77·9	—	72·4	—	—	107·6	—	5·5	57·3	74·5	—	—	—	—	—
—	35·5	28·9	76·3	76·9	71·6	71·8	72·4	106·6	106·2	4·7	59·0	81·4	—	—	—	—	—
—	35·8	28·9	76·3	76·3	66·8	66·8	66·8	114·2	114·2	9·5	56·9	80·7	—	—	—	—	—
—	36·6	29·8	74·7	76·2	70·3	69·7	71·3	106·3	107·2	4·4	56·3	81·4	—	—	—	—	—
10·5	33·9	30·7	81·1?	82·5?	69·7?	69·7?	70·9	116·3	116·3	11·4?	56·3	90·6	—	53·6	52·5	52·4	—
—	—	—	82·6	82·6	77·3?	80·5?	80·5?	106·8?	102·5?	5·2?	—	—	—	52·2	51·2	49·9	5
—	38·3?	33·7	75·4?	—	77·3?	—	—	97·6	—	−1·9?	69·5	88·0?	—	45·1	44·1	44·3	—
10·8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50·6	49·9	4
—	—	—	—	—	—	—	—	—	—	—	62·8?	—	—	—	—	—	—
—	32·3	27·7	77·2	77·2	69·4	68·9	68·9	111·2	112·1	7·8	57·4	85·8	—	50·5	50·0	48·8	4
—	36·1	31·1	76·8	78·4	74·0	74·9	76·4	103·8	102·6	2·8	61·3	86·1	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4
—	36·1	29·4	79·0	79·7	74·6	75·1	75·8	105·9	105·1	4·4	63·4	81·4	—	—	—	—	4
—	31·0	27·9	79·2	79·9	73·2	73·2	73·8	108·2	108·2	6·0	57·6	90·0	—	—	—	—	—
—	32·2	27·5	79·6	80·2	68·8	68·2	68·8	115·7	116·6	10·8	57·9	85·4	—	—	—	—	—
—	—	—	74·2	—	—	—	—	—	—	—	—	—	73·1	—	52·8	52·8	5
—	33·6	27·8	73·6	73·8	70·3	69·8	70·0	104·7	105·5	3·3	58·5	82·7	—	—	49·5	—	3
—	—	—	—	—	—	—	—	—	—	—	62·1	—	73·0	55·2	52·3	51·2	5
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
—	—	—	—	—	—	—	—	—	—	—	—	—	76·6	—	—	—	5
—	38·2	32·9	88·9	89·7	77·2	77·2	77·9	115·2	115·2	11·7	72·2	86·1	—	—	—	—	5
—	—	—	78·1	78·1	—	—	—	—	—	—	65·0	—	—	—	—	—	—
—	35·6	31·7	79·2	79·2	74·1	74·1	74·1	106·9	106·9	5·1	58·5	89·0	—	—	—	—	5
—	30·7	26·4	—	—	72·4	—	—	—	—	—	57·4	86·0	—	—	—	—	—
—	38·1	—	81·7	82·2	72·5	72·5	72·9	112·8	112·8	9·3	59·6	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	58·4	—	—	46·3	46·3	44·8	5
—	34·8	31·0	—	—	—	—	—	—	—	—	62·4	89·1	—	—	—	—	—

R	$\frac{100 \cdot NB}{NH}$, L	$\frac{100 \cdot SS}{SC}$	$\frac{100 \cdot O_2}{O_1}$ R	$\frac{100 \cdot O_2}{O_1}$, L	$\frac{100 \cdot G_2}{G_1}$	$\frac{100 \cdot G_2}{G_1'}$	$\frac{100 \cdot EH}{G_2}$	Remarks
	—	50·5	—	—	—	—	—	Wormians in lambdoid suture R. and L.
	—	—	—	—	—	—	—	Ageing; all sutures closing. JR. Wound on parietal bone L.
	—	—	—	—	—	—	—	Sagittal suture closing. Wormians in lambdoid suture L. J=.
	—	—	—	—	—	—	—	Sagittal suture closed, coronal and lambdoid nearly closed. Wormians in lambdoid R.
	—	—	—	—	—	—	—	Sagittal suture closing. JR.
	58·1	41·2	76·8	79·4	81·5	86·8	28·7	Sagittal suture closing. Numerous wormians in lambdoid L. Large ossicle of λ and 1 carious.
	—	55·6	—	—	—	—	—	Coronal suture closed.
	51·0	33·9	74·5	81·9	—	—	—	Sagittal suture closed, lambdoid and coronal closing. Wormians in lambdoid R. and 6 teeth lost before death. JL.
	—	—	—	—	—	—	—	Sagittal suture closed, lambdoid and coronal closing. JR. Bridge joining lateral pter
	—	—	—	—	—	—	—	Numerous wormians in lambdoid suture R. and L. Metopic suture only open near br
	—	—	—	—	—	—	—	Aged; sagittal and coronal sutures partly obliterated, lambdoid closed.
	—	—	—	—	—	—	—	All sutures closing. Numerous wormians in lambdoid R. and L. Styliform process (r
	—	71·1	—	—	—	—	—	Sagittal suture closed, lambdoid and coronal closing. Wormian in lambdoid R. Preco
	—	46·7	—	—	—	—	—	Sagittal and lambdoid sutures closing; metopic closed.
	—	—	—	—	—	—	—	All sutures closing. Epipteric bones R. and L. J=. Large mastoid foramen L. Asy
	—	52·2	—	75·9	—	—	—	All sutures closing.
	—	—	—	—	—	—	—	Aged; sagittal suture quite, coronal and lambdoid partly obliterated. JL.
	—	—	—	—	—	—	—	Aged; sagittal suture obliterated, coronal and lambdoid closed. JL. Precondyles.
	—	49·0	—	74·1	—	—	—	Aged; sagittal suture quite, coronal and lambdoid partly obliterated.
	—	42·0	75·7	74·1	—	—	—	All sutures closing. Wormians in lambdoid L. JR. All teeth apparently lost before d
	—	—	—	—	—	—	—	All sutures closing. J=.
	48·9	43·2	—	81·2?	—	—	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid L. Ossicle of λ. All te
	—	—	—	—	76·0	85·4	38·0	Large wormian in lambdoid suture R. Large epipteric bone L. No teeth lost before
	—	—	77·2	—	—	—	—	Wormians in lambdoid suture R. and L. 5 or more teeth present at death.
	49·3	46·4	—	—	—	—	—	Ageing; sagittal suture partly obliterated, lambdoid and coronal closing. Wormian in before death.
	—	—	79·1	—	—	—	—	Double ossicle of λ. Epipteric bone R. No teeth lost R. before death: 3rd molars no
	49·0	42·3	80·1	—	—	—	—	Ageing; sagittal suture nearly obliterated, coronal and lambdoid nearly closed. Wo
	—	—	—	80·4	—	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal nearly closed.
	—	—	—	—	—	—	—	Ageing; sagittal suture nearly obliterated, lambdoid and coronal closing. Wormians condyle R. JR.
	—	—	—	—	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians
	—	—	70·0	—	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closed. Wormians i
	—	—	—	82·9	—	—	—	Ageing; sagittal and coronal sutures closed, lambdoid nearly closed. Wormians in l
	—	—	—	—	—	—	—	Sagittal suture closing. Wormians in lambdoid suture R. and L. Epipteric bone L.
5	52·4	—	—	76·1	89·5?	97·4?	25·1	Wormian in lambdoid suture L. 2 large symmetrically placed interparietal bones m 1 molar carious.
2	49·9	54·1	74·1	71·0	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians
1	44·3	—	—	—	—	—	—	Aged; all sutures nearly obliterated. Wormians in lambdoid R. and L. Large preco
5	49·9	43·7	84·3	83·5	81·7	87·7	26·2	Sagittal and lambdoid sutures closing. Metopic LF+RP 3 mm. Small epipteric bo
	—	—	—	82·5	—	—	—	Ageing; sagittal suture partly obliterated, coronal closing. No teeth lost L. before d
0	48·8	43·4	78·5	77·1	—	—	—	Ageing; sagittal and coronal sutures closed, lambdoid closing. Complex sutures. JH Abscess at socket of upper M_3R.
	—	—	—	—	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. J=.
	—	43·2	—	—	—	—	—	
	—	45·0	—	85·7	—	—	—	All sutures beginning to close. Ossicle of λ. Epipteric bone L. JL.
	—	—	—	—	—	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal nearly closed. J=.
	—	—	—	—	—	—	—	Wormians in lambdoid suture R. and L. J=.
8	52·8	50·0	77·2	74·2	—	—	—	Wormians in lambdoid suture R. and L. Teeth worn but most present at death.
5	—	36·1	—	72·4	—	—	—	Aged; all sutures nearly obliterated. Wormians in lambdoid R. and L. Ossicles at a
3	51·2	52·9	83·4	78·1	—	—	—	Aged; all sutures nearly obliterated. Teeth moderately worn but none lost before de
	—	39·4	—	84·2	—	—	—	Sagittal and coronal sutures closing. No teeth lost L. before death.
	—	57·6	77·9	79·5	—	—	—	Sagittal and coronal sutures closing. Large ossicles at λ. Asymmetrical. Teeth mod
	—	58·8?	—	77·1	—	—	—	Aged; all sutures nearly obliterated. JL.
	—	—	—	—	—	—	—	Aged; all sutures nearly obliterated. Asymmetrical.
	—	52·8?	—	73·3	—	—	—	Wormians in lambdoid suture R. and L. Double ossicle of λ, ossicle at asterion L.
	—	—	81·4	—	—	—	—	No teeth lost R. before death.
	—	—	—	75·5	—	—	—	Ageing; sagittal suture obliterated, coronal and lambdoid closing. JL. 6 or more t
3	44·8	57·5	81·0	—	—	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal closed. Teeth great
	—	—	—	—	—	—	—	Ageing; all sutures closed. Wormian in lambdoid R. Teeth worn, but none lost R.

	100 $\frac{G_2}{G_1}$	100 $\frac{G_2}{G_1'}$	100 $\frac{EH}{G_2}$	Remarks
	—	—	—	Wormians in lambdoid suture R. and L.
	—	—	—	Ageing; all sutures closing. JR. Wound on parietal bone L.
	—	—	—	Sagittal suture closing. Wormians in lambdoid suture L. J=.
	—	—	—	Sagittal suture closed, coronal and lambdoid nearly closed. Wormians in lambdoid R. and L. JR.
	—	—	—	Sagittal suture closing. JR.
	81·5	86·8	28·7	Sagittal suture closing. Numerous wormians in lambdoid L. Large ossicle of λ and ossicle above it in sagittal sutur 1 carious.
	—	—	—	Coronal suture closed.
	—	—	—	Sagittal suture closed, lambdoid and coronal closing. Wormians in lambdoid R. and L. Ossicle of λ. Metopic LF + RI 6 teeth lost before death. JL.
	—	—	—	Sagittal suture closed, lambdoid and coronal closing. JR. Bridge joining lateral pterygoid plate to spina angularis of
	—	—	—	Numerous wormians in lambdoid suture R. and L. Metopic suture only open near bregma LF + RP 2 mm. JL. Largs
	—	—	—	Aged; sagittal and coronal sutures partly obliterated, lambdoid closed.
	—	—	—	All sutures closing. Numerous wormians in lambdoid R. and L. Styliform process (14 mm.) on temporal squama L.
	—	—	—	Sagittal suture closed, lambdoid and coronal closing. Wormian in lambdoid R. Precondyles, R. smaller than L. JR.
	—	—	—	Sagittal and lambdoid sutures closing; metopic closed.
	—	—	—	All sutures closing. Epipteric bones R. and L. J=. Large mastoid foramen L. Asymmetrical.
	—	—	—	All sutures closing.
	—	—	—	Aged; sagittal suture quite, coronal and lambdoid partly obliterated. JL.
	—	—	—	Aged; sagittal suture obliterated, coronal and lambdoid closed. JL. Precondyles.
	—	—	—	Aged; sagittal suture quite, coronal and lambdoid partly obliterated.
	—	—	—	All sutures closing. Wormians in lambdoid L. JR. All teeth apparently lost before death and alveoli completely absc
	—	—	—	All sutures closing. J=.
	—	—	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid L. Ossicle of λ. All teeth but 1 apparently lost before
	76·0	85·4	38·0	Large wormian in lambdoid suture R. Large epipteric bone L. No teeth lost before death. 2 molars carious.
	—	—	—	Wormians in lambdoid suture R. and L. 5 or more teeth present at death.
	—	—	—	Ageing; sagittal suture partly obliterated, lambdoid and coronal closing. Wormian in lambdoid R. Ossicle of bregma before death.
	—	—	—	Double ossicle of λ. Epipteric bone R. No teeth lost R. before death: 3rd molars not erupted. JR.
	—	—	—	Ageing; sagittal suture nearly obliterated, coronal and lambdoid nearly closed. Wormian in lambdoid R. Most of th
	—	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal nearly closed.
	—	—	—	Ageing; sagittal suture nearly obliterated, lambdoid and coronal closing. Wormians in lambdoid R. and L. Ossicle condyle R. JR.
	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. Small epip
	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closed. Wormians in lambdoid R. and L. Precondyl
	—	—	—	Ageing; sagittal and coronal sutures closed, lambdoid nearly closed. Wormians in lambdoid R. and L. JL.
	—	—	—	Sagittal suture closing. Wormians in lambdoid suture R. and L. Epipteric bone L. JL.
	89·5?	97·4?	25·1	Wormian in lambdoid suture L. 2 large symmetrically placed interparietal bones meeting below λ. JR. Teeth consi 1 molar carious.
	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. Asymme
	—	—	—	Aged; all sutures nearly obliterated. Wormians in lambdoid R. and L. Large precondyle R. 1 or more teeth lost bef
	81·7	87·7	26·2	Sagittal and lambdoid sutures closing. Metopic LF + RP 3 mm. Small epipteric bone R. Teeth worn but none lost b
	—	—	—	Ageing; sagittal suture partly obliterated, coronal closing. No teeth lost L. before death.
	—	—	—	Ageing; sagittal and coronal sutures closed, lambdoid closing. Complex sutures. JR. 8 teeth lost before death. M Abscess at socket of upper M_3R.
	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. J=.
	—	—	—	
	—	—	—	All sutures beginning to close. Ossicle of λ. Epipteric bone L. JL.
	—	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal nearly closed. J=.
	—	—	—	Wormians in lambdoid suture R. and L. J=.
	—	—	—	Wormians in lambdoid suture R. and L. Teeth worn but most present at death.
	—	—	—	Aged; all sutures nearly obliterated. Wormians in lambdoid R. and L. Ossicles at asteria. Small epipteric bone L.
	—	—	—	Aged; all sutures nearly obliterated. Teeth moderately worn but none lost before death.
	—	—	—	Sagittal and coronal sutures closing. No teeth lost L. before death.
	—	—	—	Sagittal and coronal sutures closing. Large ossicles at λ. Asymmetrical. Teeth moderately worn but none lost R. bef
	—	—	—	Aged; all sutures nearly obliterated. JL.
	—	—	—	Aged; all sutures nearly obliterated. Asymmetrical.
	—	—	—	Wormians in lambdoid suture R. and L. Double ossicle of λ, ossicle at asterion L. Basal suture not obliterated. J=
	—	—	—	No teeth lost R. before death.
	—	—	—	Ageing; sagittal suture obliterated, coronal and lambdoid closing. JL. 6 or more teeth present L. at death.
	—	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal closed. Teeth greatly worn and several lost before de
	—	—	—	Ageing; all sutures closed. Wormian in lambdoid R. Teeth worn, but none lost R. before death.

in sagittal suture. No teeth lost before death, but all greatly worn.

Metopic LF + RP 1 mm. Wound across parietal and temporal bones L.

pina angularis of sphenoid on R. side.
2 mm. JL. Large irregular condyles with double articular surfaces.

oral squama L.
ler than L. JR. Epipteric bone L.

i completely absorbed.

ently lost before death and alveoli completely absorbed.
s carious.

Ossicle of bregma. Epipteric bone R. Teeth worn and 2 or more lost

id R. Most of the teeth lost before death.

and L. Ossicle of λ. Bathrocephalic. Depression at obelion. Pre-

and L. Small epipteric bone R. JR. Prominent external occipital crest.
nd L. Precondyles. J=. 7 teeth present R. at death.
L. JL.

JR. Teeth considerably worn and 2 central incisors lost before death.

and L. Asymmetrical. 10 or more teeth present at death.
ore teeth lost before death; 1 carious; teeth worn.
n but none lost before death.

before death. Mandible with 4 teeth lost before death. Teeth worn.

ipteric bone L. JL.

none lost R. before death.

obliterated. J=.

t death.
ral lost before death.

No.	Sex	C	IOW	B′	B″	B	Biasterionic B	F	L	H′	LB	S_1'	S_2'	S_3'	S_1	S_2
I	♂?	—	92·5	90·1	121	145·5	106	165	168	—	—	112·9	105·2	90·6	130·5	121·
II	,,	—	—	98·1	119·5	144?	—	177·5	181	—	—	—	110·0	—	—	123·
14	,,	—	—	—	—	144	113	175	177	—	—	108·2	—	96·0	123	—
20	,,	—	—	—	—	138	113?	—	181	—	—	111·2	111·0	100·0	—	122
31	,,	—	—	101·6	120	144	111	169·5	172	—	—	103·9	105·4	99·9	118·5	116
33	,,	—	86	87·4	121	146·5	105·5	176·5	178	—	—	111·3	113·8	99·8	129	128
37	,,	—	—	97·7	—	144	105	170	177	—	102·3	—	—	91·0	—	—
41	,,	—	99	103·0	124·5	139·5	108·5	186·5	189	—	—	116·0	116·0	99·1	135	128·
45	,,	—	93·5	93·2	117·5	131·5	105	179	182	—	—	112·1	107·6	—	129	119·
51	,,	—	—	—	—	140	107	—	—	—	—	—	105·0	96·4	—	117
73	,,	—	—	—	—	—	114	—	—	131·5	—	—	109·0	94·8	—	121·
76	,,	—	—	90·2	118	145	—	—	—	—	—	114·0	—	—	132	—
109	♂	—	103	107·1	131·5	144·5	112·5?	188	189	—	—	114·4	116·1	95·7	133·5	132·
113	,,	—	105	102·6	—	145·5	109?	182·5	184·5	—	—	109·8	116·8	—	125·5	130·
122	♂?	—	93	90·1	115·5	136·5	114·5	176·5	180	—	—	106·1	112·0	—	118	—
126	,,	—	99	100·3	122	149	112·5	180	182	—	—	107·2	111·9	95·2	121	125
140	,,	—	—	—	132?	145	102·5	—	—	—	—	—	122·1	105·8	—	138·
141	,,	—	—	—	—	—	—	179	179?	—	—	109·9	106·1	106·0	126	115
147	,,	—	100·5?	—	121?	—	115·5	—	—	132	—	—	112·1	95·4	—	123
152	,,	—	—	—	122	141	109	—	—	143	—	—	117·0	99·1	—	133
154	,,	—	—	—	—	—	104?	—	182·5?	—	—	111·1	102·8	99·8	130·5?	112
218	,,	—	100·5	100·4	130·5	148	—	174	177	—	—	115·6	117·0	93·7	133	135·
219	,,	—	96·5	102·3	121	141	111?	185	189	—	—	114·0	114·9	103·0	127·5	128
220	,,	—	—	93·6	115	141	—	179·5	182	—	—	117·3	118·0?	92·6	138	130·
221	,,	—	99·5	95·0	—	138	109?	179	182	—	—	106·1	109·3	102·0	121	122
227	,,	—	101·5	101·5	—	148·5	111·5	184	187·5	131·5	98·1	113·2	115·1	101·9	132·5	133
231	,,	—	101	105·1	122	146	—	185	190	—	—	118·0	110·2	107·0	133	121·
232	,,	—	95·5	98·1	123·5	143	—	181·5	187	—	—	111·1	110·5	101·0	126·5	123
239	,,	—	99	101·2	117?	137	110	185	187	—	—	110·0	112·2	90·3	126·5	127
240	,,	—	—	—	136	153	—	177·5	178	137?	100·1?	117·5	113·4	96·7	135	126
241	,,	—	100	97·0	—	140	116·5	177·5	178	—	—	107·9	116·2	—	123	132
245	,,	—	—	—	126·5	144	—	179	182	—	—	108·0	123·5	87·4	123	143·
263	,,	—	95·5	95·9	—	—	115?	177	177	—	—	109·1	108·7	—	127	120·
269	,,	—	—	—	—	—	—	170	172·5	—	—	107·0	114·1	96·4	125·5	128
312	,,	—	98	103·1	130·5	144·5	107·5	175	176	—	—	114·9	111·6	92·7	132	127
314	,,	—	98	93·1	115·5	137	—	171	173·5	—	—	107·3	104·7	—	120	115·
315	♂	—	97	99·9	125	152	—	193·5	198	—	—	118·7	129·8	—	138·5	146·
320	♂?	—	100·5	99·7	132	148	—	175	177·5	—	—	111·2	102·4	103·0	129·5	113·
335	,,	—	96·5?	99·1	—	144	—	183·5	187	—	—	111·2	111·2	91·9	130	124
337	,,	—	96	99·9	121?	138?	—	181	182·5	—	—	115·0	111·8	98·1	131·5	124
342	,,	—	105	107·4	131	149	—	179·5	183	129?	104·0	111·2	112·6?	99·1	126	129?
344	,,	—	101	108·4	—	158?	—	179	183	—	—	118·1	110·2	100·3	137	129
380	,,	—	—	—	121·5	—	—	178	180?	—	—	112·9	—	—	128	—
385	,,	—	98·5	101·3	118·5?	—	—	170	172·5	—	—	108·1	107·7	95·1	122	121
411	,,	1700	95·5	101·1	128	144	112·5?	193	193	135·5	98·1	118·2	122·5	100·7	138·5	137
425	♂	—	102	97·4	—	152	—	175·5	178	—	—	112·1	111·6	99·0	128	126
427	♂?	—	100	103·9	126·5	145	114·5	180·5	181·5	—	—	112·7	108·9	97·0	129·5	123
429	,,	—	—	—	—	150	116	181·5	182	—	—	116·2	116·0	98·1	132	130
435	,,	—	—	—	—	143	—	184·5	184	—	—	115·5	115·4	98·3	138	127·
451	,,	—	—	—	—	—	—	177	180	—	—	110·0	107·9	99·1	125	119
524	,,	—	99·5	95·4	113?	135	—	178	182	—	—	112·0	111·8	99·0	127·5	123·
540	,,	—	—	—	125·5	144	110	—	186?	—	—	—	122·0	87·3	—	141·
547	,,	—	—	—	122·5?	144·5	—	171	172	—	—	104·0	103·0	93·3	120	118
582	,,	—	102	101·9	—	—	—	—	—	—	—	109·4	114·2	93·9	125	132
588	,,	—	—	—	—	152	—	—	—	—	—	—	111·3	95·2	—	123·
610	,,	—	99	104·8	124·5	139	111·5?	172·5	173·5	—	—	107·1	109·0	94·1	128	120·
613	,,	—	99·5	99·4	—	149	112·5?	178	179	—	—	118·1	112·1	92·1	135·5	124
620	,,	—	95	99·2	122·5	144	—	177·5	181	—	—	115·9	112·6	94·4	134	124·
625	,,	—	99	95·3	121?	138	—	185	187	—	—	108·2	112·1	99·4	124	125
628	,,	—	93	98·0	119	139	113·5	174	177	—	—	110·5	111·3	95·7	124	125
630	,,	—	95·5	98·7	120?	142	111	185	188·5	—	—	114·0	118·1	—	128	131
637	,,	—	98·5	100·0	—	148	—	183	184	—	—	117·5	120·0	97·1	136	138·
646	,,	—	95·5?	99·1	—	138	106	178	179	—	—	111·0	106·3	95·0	129·5	119
677	,,	—	—	—	—	—	—	189	191·5?	—	—	110·2	117·2	97·8	123	125
700	,,	—	102·5	107·0	—	151	—	190·5	193	—	—	126·0	116·2	99·2	150	129·
709	,,	—	95·5?	100·1	123·5?	145	—	176	178·5	—	—	112·7	104·6	94·0	129·5	117·
711	,,	—	—	—	—	140·5	106?	179	183	—	—	121·1	115·0	95·3	140	131·
712	,,	—	101	101·4	—	138	109	189·5	194·5	—	—	113·9	114·5	99·3	128·5	127
718	,,	—	97·5	96·7	114·5	143	—	175	186·5	—	—	117·3	120·0	96·1	126·5	136
723	♂	—	95	97·1	—	141·5	107·5	182·5	187	142	103·9	120·5	111·8	102·1	138	121·
740	♂?	—	—	—	125	144	109·5?	—	—	140	—	—	117·8	100·2	—	131
749	,,	—	—	—	—	151	118	—	—	131	—	—	111·2?	99·2	—	—
751	,,	—	—	—	—	141·5	—	—	—	120	—	—	102·7	90·1	—	114·
804	♂	—	94	94·0	123?	148	109·5	175	178	—	—	115·2	111·8	—	130	120
819	,,	—	100	102·1	—	148	111·5?	183	186	—	—	116·0	117·3	99·0	132	129
824	♂?	—	94·5	91·3?	125	148	—	179?	180	—	—	107·6	110·4	102·3	125	126
830	,,	—	—	—	—	144	—	185	186	—	—	118·3	125·3	93·0	137·5	143·
840	,,	—	—	—	—	142·5	—	—	—	—	—	—	114·2	97·1	—	126
842	,,	—	—	—	119?	—	111·5?	178	181	—	—	117·7	104·1	92·0	132	114
852	,,	—	—	—	—	143	—	—	—	132?	—	—	117·2	97·3	—	133·
853	♂	—	—	—	—	150	—	—	—	131	—	—	111·5	99·0	—	124
858	♂?	—	—	—	139·5?	153	114	—	—	—	—	—	116·2	91·1	—	131

	S_1	S_2	S_3	S	U	*Bregmatic* Q'	*Broca's* Q'	*fml*	*fmb*	100 $\frac{B}{L}$	100 $\frac{H'}{L}$	100 $\frac{B}{H'}$	100 $\frac{(B-H')}{L}$	*Oc. I.*	100 $\frac{fmb}{fml}$	
·6	130·5	121·5	103	355	488	315	308	—	—	86·6	—	—	—	66·9	—	Sagittal suture closing. W
	—	123·5	—	—	517	—	—	—	—	79·6?	—	—	—	—	—	Ageing; sagittal suture p
·0	123	—	118	—	—	313	305	—	—	81·4	—	—	—	58·1	—	Coronal and lambdoid su
·0	—	122	120	—	—	313	305	—	—	76·2	—	—	—	60·0	—	Sagittal suture closing. W
·9	118·5	116	117·5	352	501	311	297	—	—	83·7	—	—	—	62·1	—	All sutures closing. Worm
·8	129	128	119·5	376·5	513	319	310	—	—	82·3	—	—	—	60·2	—	All sutures beginning to c
·0	—	—	—	—	503	—	—	32·8	29·0	81·4	—	—	—	—	88·4	Ageing; sagittal suture p
·1	135	128·5	118	382	526	318	307	—	—	73·8	—	—	—	60·7	—	Aged; sagittal suture obl
	129	119·5	—	—	502?	—	—	—	—	72·2	—	—	—	—	—	Sagittal suture closing. C
·4	—	117	116·5	—	—	—	308	—	—	—	—	—	—	59·4	—	Sagittal and lambdoid su
·8	—	121·5	120	—	—	—	—	33·2	31·6	—	—	—	—	56·4	95·2	——
	132	—	—	—	—	—	309?	—	—	—	—	—	—	—	—	——
·7	133·5	132·5	115	381	538?	333	326	—	—	76·5	—	—	—	59·9	—	Sagittal suture closing, c
	125·5	130·5?	—	—	528	326	319	—	—	78·9	—	—	—	—	—	Aged; sagittal and lambo
	118	—	—	359?	—	—	—	—	—	75·8	—	—	—	—	—	Sagittal suture closed, la
·2	121	125	116	362	—	—	—	—	—	81·9	—	—	—	58·8	—	——
·8	—	138·5	126	—	—	335?	327	—	—	—	—	—	—	60·7	—	All sutures beginning to
·0	126	115	120	361	—	—	—	—	—	—	—	—	—	67·7	—	Sagittal suture closed, la
·4	—	123	119	—	—	—	—	38·0	—	—	—	—	—	57·2	—	Sagittal suture closing, c
·1	—	133	118	—	—	—	—	37·5	31·2	—	—	98·6	—	59·9	83·2	Ageing; sagittal suture c
·8	130·5?	112	125	367?	—	—	—	—	—	—	—	—	—	56·9	—	Sagittal and coronal sutu
·7	133	135·5	108	377	518	330	319	—	—	83·6	—	—	—	64·6	—	Ageing; sagittal suture p
·0	127·5	128	125	380	524	—	—	—	—	74·6	—	—	—	59·0	—	Sagittal suture closing, c
·6	138	130·5?	109?	378?	—	—	—	—	—	77·5	—	—	—	62·0?	—	Ossicles of λ. Tympanic p
·0	121	122	126	369	513	308	296	—	—	75·8	—	—	—	57·8	—	All sutures closing. Worn
·9	132·5	133	119	385	—	—	—	36·3?	—	79·2	70·1	112·9	9·1	62·9	—	All sutures closing. Exo
·0	133	121·5	131	385	536	321	313	—	—	76·8	—	—	—	58·4	—	Sagittal suture closing. W
·0	126·5	123	122	371	—	—	—	—	—	76·5	—	—	—	59·4	—	Sagittal and lambdoid su
·3	126·5	127	110·5	364	—	—	—	—	—	73·3	—	—	—	58·4	—	Sagittal suture closing.
·7	135	126	116	377	536?	340	329	—	—	86·0	77·0?	111·7?	9·0?	60·0	—	All sutures beginning to
	123	132	—	—	513	311	301	—	—	78·7	—	—	—	—	—	Ageing; sagittal suture p
·4	123	143·5	108	375	—	—	—	—	—	79·1	—	—	—	57·7	—	All sutures closing. Worn
	127	120·5	—	—	511?	—	—	—	—	—	—	—	—	—	—	Sagittal suture partly ob
·4	125·5	128	112·5	366	—	—	—	—	—	—	—	—	—	63·0	—	Sagittal suture closing. V
·7	132	127	113	372	514	332?	325	—	—	82·1	—	—	—	58·7	—	Interparietal os triangul
	120	115·5	—	—	494?	—	—	—	—	79·0	—	—	—	—	—	Sagittal suture partly ob
	138·5	146·5	—	—	554?	—	—	—	—	76·8	—	—	—	—	—	Sagittal suture closed, co
·0	129·5	113·5	127	370	—	—	—	—	—	83·4	—	—	—	57·9	—	Sagittal and lambdoid su
·9	130	124	113	367	—	—	—	—	—	77·0	—	—	—	58·1	—	Sagittal suture beginning
·1	131·5	124	118	374	—	316?	308·5?	—	—	75·6?	—	—	—	59·8	—	Ageing; sagittal and lam
·1	126	129?	116	371	—	—	—	—	—	81·4	70·5?	115·5?	10·9?	62·8	—	Coronal and sagittal sutu
·3	137	129	118·5	385	—	—	—	—	—	86·3?	—	—	—	61·6	—	Sagittal suture partly ob
	128	—	—	379?	—	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid su
·1	122	121	120·5	363	—	—	—	—	—	—	—	—	—	56·3	—	Aged; sagittal and coron
·7	138·5	137	127	402	539	329	320	37·2	29·1	74·6	70·2	106·3	4·4	56·6	78·2	Ageing; sagittal suture p
·0	128	126	120·5	375	—	—	—	—	—	85·4	—	—	—	58·8	—	Sagittal suture partly ob
·0	129·5	123	119	371	523	311	301	—	—	79·9	—	—	—	58·2	—	Ageing; all sutures close
·1	132	130	115·5	378?	—	—	—	—	—	82·4	—	—	—	62·0	—	Sagittal suture closed, co
·3	138	127·5	120·5	386	—	318?	310	—	—	77·7	—	—	—	58·3	—	All sutures closing. Wor
·1	125	119	119·5	363	—	—	—	—	—	—	—	—	—	59·6	—	Sagittal and lambdoid su
·0	127·5	123·5	116·5	367	—	—	—	—	—	74·2	—	—	—	62·0	—	Sagittal and coronal sut
·3	—	141·5	108	—	—	317	308·5	—	—	77·4?	—	—	—	57·7	—	Sagittal suture closing.
·3	120	118	113	351	—	—	—	—	—	84·0	—	—	—	59·2	—	Sagittal and lambdoid s
·9	125	132	120?	377?	—	—	—	—	—	—	—	—	—	55·9?	—	Sagittal suture closed, l
·2	—	123·5	114	—	—	324	311	34·2	26·7	—	—	—	—	60·2	78·1	Aged; all sutures nearly
·1	128	120·5	107	356	—	—	—	—	—	80·1	—	—	—	66·9	—	Sagittal suture closing.
·1	135·5	124	112	372	516?	317?	312	—	—	83·2	—	—	—	58·9	—	Aged; sagittal and lamb
·4	134	124·5	113	372	—	—	—	—	—	79·6	—	—	—	60·2	—	——
·4	124	125	120·5	369	—	—	—	—	—	73·8	—	—	—	59·2	—	Sagittal suture closed, c
·7	124	125	118	367	500	317	308	—	—	78·5	—	—	—	57·9	—	Wormians in lambdoid s
	128	131	—	—	527?	320?	305	—	—	75·3	—	—	—	—	—	Aged; sagittal suture qu
·1	136	138·5	117	391	527	335	326	—	—	80·4	—	—	—	59·6	—	Aged; all sutures nearly
·0	129·5	119	112	361	—	308	297	—	—	77·1	—	—	—	61·8	—	All sutures closing. Wo
·8	123	125	120	368?	—	—	—	—	—	—	—	—	—	58·2	—	Wormians in lambdoid s
·2	150	129·5	119·5	399	550?	339	330·5	—	—	78·2	—	—	—	59·6	—	All sutures closing. 2 s
·0	129·5	117·5	117·5	365	512?	313	301·5	—	—	81·2	—	—	—	57·1	—	Sagittal and lambdoid s
·3	140	131·5	110·5	382	—	—	—	—	—	76·8	—	—	—	63·9	—	Ageing; all sutures close
·3	128·5	127	122·5	378	530	313	303	—	—	71·0	—	—	—	57·8	—	Ageing; sagittal suture
·1	126·5	136	114·5	377	515	324	314·5	—	—	76·7	—	—	—	60·7	—	Aged; all sutures partly
·1	138	121·5	126	386	—	—	—	32·0	28·7	75·7	75·9	99·6	−0·2	57·8	89·7	Sagittal suture closed, c
·2	—	131	116·5	—	—	319	309	34·2	29·9	—	—	102·9	—	63·4	87·4	Sagittal suture partly o
·2	—	—	123	—	—	328	320	35·1	28·6	—	—	115·3	—	57·5	81·5	Sagittal and lambdoid s
·1	—	114·5	113	—	—	304?	295?	35·5	25·6	—	—	117·9	—	56·9	72·1	All sutures closing. Oss
	130	120	—	—	510	338	326	—	—	83·1	—	—	—	—	—	Ageing; all sutures clos
·0	132	129	128	389	—	—	—	—	—	79·6	—	—	—	55·4	—	Ageing; sagittal suture
·3	125	126	122	373	—	—	—	—	—	82·2	—	—	—	60·5	—	Sagittal suture closed.
·0	137·5	143·5	109	391	—	—	—	—	—	77·4	—	—	—	63·5	—	All sutures closing.
·1	—	126	117	—	—	333	—	—	—	—	—	—	—	59·6	—	Wormians in lambdoid
·0	132	114	106·5	353	—	—	—	—	—	—	—	—	—	64·0	—	Wormians in lambdoid
·3	—	133·5	117	—	—	—	—	35·8	30·9	—	—	108·3?	—	59·9	86·3	All sutures closing. La
·0	—	124	—	—	—	—	—	33·4	32·1	—	—	114·5	—	—	96·1	Ageing; all sutures near
·1	—	131	111	—	—	341	—	—	—	—	—	—	—	58·8	—	Wormians in lambdoid

Oc. I.	100 *fmb* / *fml*	Remarks
66·9	—	Sagittal suture closing. Wormian in lambdoid L. Ossicles at asteria.
—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. Thin bones.
58·1	—	Coronal and lambdoid sutures closing.
60·0	—	Sagittal suture closing. Wormians in lambdoid R. and L. Ossicle of λ.
62·1	—	All sutures closing. Wormians in lambdoid R. and L. Epipteric bone R.
60·2	—	All sutures beginning to close. Tympanic perforation R. and L.
—	88·4	Ageing; sagittal suture partly obliterated, lambdoid nearly closed. JR. Wound on occipital bone.
60·7	—	Aged; sagittal suture obliterated, coronal closed, lambdoid closing. Bipartite *os épactal*.
—	—	Sagittal suture closing. Ossicle of λ.
59·4	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L.
56·4	95·2	——
—	—	——
59·9	—	Sagittal suture closing, coronal and lambdoid beginning to close. Metopic RF + LP 7 mm. Tympanic perforation R. Asymmetrical.
—	—	Aged; sagittal and lambdoid sutures partly obliterated, coronal closed.
—	—	Sagittal suture closed, lambdoid beginning to close. Wormians in lambdoid L.
58·8	—	——
60·7	—	All sutures beginning to close.
67·7	—	Sagittal suture closed, lambdoid closing, coronal beginning to close. Metopic LF + RP 3·5 mm.
57·2	—	Sagittal suture closing, coronal and lambdoid beginning to close. Slight tympanic perforation R.
59·9	83·2	Ageing; sagittal suture closed, coronal and lambdoid closing. Wormians in lambdoid R. and L. Ossicles at asteria.
56·9	—	Sagittal and coronal sutures closing.
64·6	—	Ageing; sagittal suture partly obliterated, coronal closed, lambdoid closing.
59·0	—	Sagittal suture closing, coronal and lambdoid beginning to close. Wormian in lambdoid R.
62·0?	—	Ossicles of λ. Tympanic perforation R.
57·8	—	All sutures closing. Wormians in lambdoid R. and L. Ossicle of λ. Interparietal os triangulare R. and L.
62·9	—	All sutures closing. Exostoses on parietal bone R.
58·4	—	Sagittal suture closing. Wormians in lambdoid R. and L. Asymmetrical.
59·4	—	Sagittal and lambdoid sutures closing, coronal beginning to close. Wormians in lambdoid R. and L. Ossicles at asteria. Wound on pa
58·4	—	Sagittal suture closing.
60·0	—	All sutures beginning to close. Wormians in lambdoid R. and L. Ossicle of λ and ossicle at asterion R.
—	—	Ageing; sagittal suture partly obliterated, lambdoid and coronal closing. Wormians in lambdoid R. and L.
57·7	—	All sutures closing. Wormians in lambdoid R. and L.
—	—	Sagittal suture partly obliterated, lambdoid and coronal open.
63·0	—	Sagittal suture closing. Wormians in lambdoid R.
58·7	—	Interparietal os triangulare L. Asymmetrical occiput, L. side protruding.
—	—	Sagittal suture partly obliterated. Depression at obelion.
—	—	Sagittal suture closed, coronal and lambdoid closing. Wormians in lambdoid R. and L.
57·9	—	Sagittal and lambdoid sutures partly obliterated, coronal open. Wormians in lambdoid R. and L.
58·1	—	Sagittal suture beginning to close. Wormians in lambdoid R. and L. Asymmetrical.
59·8	—	Ageing; sagittal and lambdoid sutures partly obliterated, coronal nearly closed.
62·8	—	Coronal and sagittal sutures open, lambdoid open R. but obliterated L. Metopic LF + RP 4 mm.
61·6	—	Sagittal suture partly obliterated, lambdoid closing, coronal beginning to close. Wormians in lambdoid R. and L.
—	—	Sagittal and lambdoid sutures beginning to close.
56·3	—	Aged; sagittal and coronal sutures quite, and lambdoid partly obliterated.
56·6	78·2	Ageing; sagittal suture partly obliterated, coronal closed, lambdoid closing. Wormians in lambdoid R. and L. Epipteric bone L. Pre
58·8	—	Sagittal suture partly obliterated. Wormians in lambdoid R. and L. Ossicle of λ.
58·2	—	Ageing; all sutures closed. Wormians in lambdoid R. and L.
62·0	—	Sagittal suture closed, coronal and lambdoid closing. Asymmetrical.
58·3	—	All sutures closing. Wormians in lambdoid R. and L.
59·6	—	Sagittal and lambdoid sutures closing, coronal beginning to close. Wormians in lambdoid R. and L. Metopic LF + RP 8 mm.
62·0	—	Sagittal and coronal sutures closing. Ossicle of λ. Asymmetrical. Wound on frontal bone.
57·7	—	Sagittal suture closing. Wormian in lambdoid L.
59·2	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. Depression at obelion.
55·9?	—	Sagittal suture closed, lambdoid nearly closed. Wormians in lambdoid R. and L. and in parieto-mastoid L. Ossicles at asteria.
60·2	78·1	Aged; all sutures nearly obliterated. JR.
66·9	—	Sagittal suture closing. Wormians in lambdoid R. and L. Metopic RF + LP 1 mm. Asymmetrical.
58·9	—	Aged; sagittal and lambdoid sutures obliterated, coronal closed. Wormians in lambdoid R. Tympanic perforation R.
60·2	—	——
59·2	—	Sagittal suture closed, coronal and lambdoid closing.
57·9	—	Wormians in lambdoid suture R. and L.
—	—	Aged; sagittal suture quite and lamboid partly obliterated, coronal nearly closed. Wormians in lambdoid R. and L. Ossicle at aste
59·6	—	Aged; all sutures nearly obliterated. Tympanic perforation R. and L.
61·8	—	All sutures closing. Wormians in lambdoid R. and L.
58·2	—	Wormians in lambdoid suture R. Flattening at obelion.
59·6	—	All sutures closing. 2 small exostoses on frontal bone.
57·1	—	Sagittal and lambdoid sutures closed. Wormians in lambdoid R. and L. Ossicle at asterion L.
63·9	—	Ageing; all sutures closed.
57·8	—	Ageing; sagittal suture nearly obliterated, coronal and lambdoid closing.
60·7	—	Aged; all sutures partly obliterated. Wormians in lambdoid R. and L. Wound on frontal bone.
57·8	89·7	Sagittal suture closed, coronal and lambdoid closing. Wormians in lambdoid R. and L. J=.
63·4	87·4	Sagittal suture partly obliterated, lambdoid closing. Wormians in lambdoid R. and L. Large ossicle of λ. Metopic LF + RP 3 mm. I
57·5	81·5	Sagittal and lambdoid sutures closing. Ossicles in parieto-mastoid R. and L. JL. Prominent external occipital crest.
56·9	72·1	All sutures closing. Ossicle at asterion L. Large precondyle L., small precondyle R. JL. Wound on parietal bone L.
—	—	Ageing; all sutures closed. Wormians in lambdoid R. and L. Ossicle of λ.
55·4	—	Ageing; sagittal suture obliterated, lambdoid and coronal beginning to close. Metopic LF + RP 5·5 mm.
60·5	—	Sagittal suture closed. Wormians in lambdoid R. and L. Ossicle of λ. Ossicle in coronal L.
63·5	—	All sutures closing.
59·6	—	Wormians in lambdoid suture R. and L. Markedly asymmetrical.
64·0	—	Wormians in lambdoid suture R. and L.
59·9	86·3	All sutures closing. Large wormian in lambdoid L. 2 distinct articular facets on condyle L. Depression at root of mastoid process I
—	96·1	Ageing; all sutures nearly closed. Wormians in lambdoid R. and L. Ossicle of λ.
58·8	—	Wormians in lambdoid suture R. and L. Ossicle of λ.

No.	Sex	C	IOW	B′	B″	B	Bias-terionic B	F	L	H′	LB	S_1'
3	♂?	—	92·5?	92·0	116?	147·5	115·5	184	187	122	92·2	115·0
9	,,	—	99	98·8	130	151	113·5	176·5	179	128	93·1	111·4
12	♂	—	96	100·0	120	141	120	182	184	125	95·8	112·9
15	,,	—	101	101·8	138	148·5	115·5	178	180	143	100·2	120·9
32	,,	—	—	—	—	147	111·5	182	183?	138·5	—	—
38	,,	—	—	—	126?	144·5	114	180	182?	136	—	—
40	,,	—	—	100·5?	124	147·5	113·5	178·5	182	129	101·7?	112·3
43	,,	—	98	104·9	130	145	115?	189·5	193	138	—	—
47	♂?	—	—	—	122·5?	145	109	—	—	127	—	—
49	,,	—	—	—	—	139·5	109·5	—	—	129	—	—
104	♂	1327	—	99·6	118?	143	115·5	182·5	186	133·5	104·1	111·3
106	♂?	—	100·5	103·6	126	135·5	106·5	173	175?	134·5	101·9	108·0
123	,,	—	95?	96·1	120	141	108	178·5	182	139	99·7	115·3
130	,,	—	—	—	—	142	109	—	172	132	—	—
139	♂	—	100·5	98·6	—	—	—	171	177	132	101·6	112·9
222	♂?	—	94·5	96·0	—	146·5	111·5	178·5	182	127?	97·9?	113·0
233	,,	—	—	—	124·5	140·5	111·5?	181	184·5	132·5	103·9	110·2
311	,,	—	97	96·2	120·5?	142	111?	169	174	129	101·9	107·6
318	,,	—	92·5	97·0	128·5	143	97	166·5	169	131	94·5	113·5
322	,,	—	97·5	101·1	108·5	144	110	179	182	129	—	—
340	,,	—	97·5	104·0	125	141	111·5	179·5	180·5?	125	101·4	108·9
341	,,	—	97·5	94·7	116·5?	144?	—	180·5	183	126?	95·2?	108·3
343	,,	—	97?	97·2	—	140?	114?	179	181	135·5	96·4	—
345	,,	—	94·5	93·4	126?	149·5?	—	175·5	178	132·5	98·1	114·0
356	,,	—	—	—	126	—	—	188·5	190	138·5	104·3?	122·2
406	,,	1357	98?	97·4	120·5	143	112	171·5	172	131	96·2	110·5
407	♂	1395	95	91·9	114·5	144	115	176·5	181	136	102·4	102·2
419	♂?	—	93·5	91·9	115·5	135	—	171	172	134	98·2	108·1
428	,,	—	97·5	97·1	128	146·5	—	172·5	174·5	137·5	—	—
431	,,	—	—	—	120·5?	144	114	165	169	132?	95·1?	107·0
436	,,	—	97·5	94·1	119	146	—	174	175·5?	139·5	—	108·3
437	,,	—	92	93·0	123·5	145	118	178·5	179	132·5	—	—
442	,,	—	—	—	—	148	114?	177	178·5	131?	98·1	112·5
511	♂	—	102·5	107·2	119·5	144	117·5	184	190·5	137	107·1	115·8
516	♂?	—	97	99·9	125·5	150	109	173	177	132	101·2	111·1
518	,,	—	94	97·1	127	151	—	183	182	143	104·1	114·0
519	,,	—	101·5	106·1	126	139	110·5	191·5	194	139	106·8	113·7
526	,,	—	—	88·2	—	143	110?	175	178	132	100·8	106·2
527	,,	—	101	100·3	—	149	107·5?	173·5	181	132	98·9	118·8
530	,,	—	—	—	—	145	—	181	184	124	100·9	108·0
541	,,	—	—	—	—	146	—	—	172·5	131	100·1	—
546	,,	—	101	99·9	—	140·5?	107?	182	186	124	103·9	105·1
611	,,	—	98	91·3	125	150	—	172·5	178	125·5	99·2	109·0
612	,,	1521	97	96·7	123	140	111?	188	191·5	140	104·5	116·0
614	,,	1493	—	91·3	119·5?	152·5	—	175·5	180	140·5	99·6	117·8
617	,,	1426	102	99·2	129	151·5	—	174	177	130	99·2	110·6
627	,,	—	87	86·8	107·5?	131	—	170·5	172	131	98·2	98·4
631	,,	—	—	—	—	141	—	175·5?	177	131	—	108·4
634	,,	—	—	—	—	138	—	179·5	182·5	128·5	98·0	109·4
644	,,	—	—	97·8	132·5	155?	110?	163·5	171·5	130	98·3	112·4
682	,,	—	—	98·1	—	—	—	183	186·5	138·5	102·0	111·4
703	,,	—	94·5	95·2	121?	134	105·5	184·5	183	125·5	95·2	104·4
704	,,	1170	—	90·8	117	134	103·5	178	182	131	103·0	105·1
715	,,	—	—	—	—	146	—	—	185·5	128	—	—
717	♂	—	—	93·5	119·5	138·5	112?	180	185	134	103·3	109·4
725	♂?	—	—	—	—	145·5?	—	183	187	133	99·7	120·4
729	,,	—	—	—	119?	148·5	—	—	—	129	—	—
734	♂	—	—	100·4	124	154	—	—	—	135	—	—
747	♂?	—	—	—	—	—	—	—	173·5	132	101·2	107·1
750	♂	—	98	93·0	—	—	—	170·5	174·5	133	107·0	107·1
762	♂?	—	—	—	—	—	—	186·5	186·5	139	114·6	107·1
801	,,	—	98	95·8	122?	140	102·5	172·5	174	128·5	101·6	101·1
803	,,	—	99	98·9	121·5	141	114·5	166	167·5	122	97·6	108·4
814	♂	—	—	97·2	125	153	122	177	183	138·5	105·7	115·1
821	,,	—	—	98·1	128	144·5	116·5?	187	189	137	102·2	117·1
825	♂?	—	—	—	—	144·5	—	181	186	127	103·2	111·1
831	,,	—	—	—	—	140·5	111	175	176	136	—	109·1
832	,,	—	97	99·7	—	136	106·5	177	179	127·5	94·1	113·1
835	,,	—	—	—	—	154	—	—	—	137	—	—
843	,,	—	—	—	121·5?	145	109	—	—	133	—	—

H'	*LB*	S_1'	S_2'	S_3'	S_1	S_2	S_3	*S*	*U*	*Bregmatic Q'*	*Broca's Q'*	*fml*	*fmb*	100 $\frac{B}{L}$	100 $\frac{H'}{L}$	100 $\frac{B}{H'}$	100 $\frac{(B-H')}{L}$	*Oc. I*
122	92·2	115·0	107·0	92·1	133·5	120	124?	378?	528	—	—	34·0	—	78·9	65·2	120·9	13·6	54·2
128	93·1	111·4	105·3	103·8	129	116·5	127	372·5	522	327	318	37·0	28·0	84·4	71·5	118·0	12·8	58·4
125	95·8	112·9	113·7	91·1	134	124·5	115	373·5	522	312	300	38·9	30·4	76·6	67·9	112·8	8·7	56·5
143	100·2	120·9	111·0	105·1	136·5	125	123·5	385	518	337	328?	39·0	28·3	82·5	79·4	103·8	3·1	62·1
138·5	—	—	106·8	92·9	—	119·5	115	—	—	326	316	36·3	27·9	79·8?	75·7?	106·1	4·1?	57·6
136	—	—	107·4	96·8	—	123	113·5	—	—	313	306	37·9	30·0	79·4?	74·7?	106·3	4·7?	62·3
129	101·7?	112·3	109·1	95·0	128	120·5	116·5	365	—	—	—	33·1	29·1	81·0	70·9?	114·3?	10·2?	58·3
138	—	—	121·1	105·0	—	134·5	126	—	542	318	307	39·9	30·2	75·1	71·5	105·1	3·6	60·0
127	—	—	113·0	93·9	—	125	113	—	—	320	307	36·1	26·7	—	—	114·2	—	59·8
129	—	—	110·0	96·9	—	124·5	116	—	—	—	—	36·1	29·9	—	—	108·1	—	60·2
133·5	104·1	111·3	108·9	95·0	128	119	115	362	521	311?	301	39·9	31·8?	76·9	71·8	107·1	5·1	59·2
134·5	101·9	108·0	109·9	95·1	123	124	111	357·5	—	—	—	36·0	29·5	77·4?	76·9?	100·7	0·6?	63·0
139	99·7	115·3	116·2	96·3	131	—	117·5	—	507	315	308	34·0	26·9	77·5	76·4	101·4	1·1	58·6
132	—	—	106·1	99·9	—	118	118	—	—	318·5	308	33·0	32·2	82·6	76·7	107·6	5·8	61·6
132	101·6	112·9	107·8	86·6	129·5	121·5	106?	357?	—	—	—	36·1	27·5	—	74·6	—	—	58·4
127?	97·9?	113·0	110·0	91·6?	130·5	127·5	113?	371	518	322	312	34·5?	25·4	80·5	69·8?	115·4?	10·7?	57·8
132·5	103·9	110·2	107·3	105·0	126	118	129	373	—	315	303·5	38·4	35·0	76·2	71·8	106·0	4·3	58·1
129	101·9	107·6	104·4	90·3	120	118·5	106·5	345	497	307	297·5	36·0	30·8	81·6	74·1	110·1	7·5	61·8
131	94·5	113·5	114·2	84·1	133	133·5	101	368	498?	315?	308?	27·8	24·8	84·6	77·5	109·2	7·1	59·9
129	—	—	115·2	91·0	—	128	107	—	520?	317	308·5?	32·2	29·0	79·1	70·9	111·6	8·2	62·1
125	101·4	108·9	102·3	95·0	125·5	113·5	120	359	519	309	300	35·9	28·3	78·1?	69·3?	112·8	8·9?	56·5
126?	95·2?	108·3	113·1	94·9	122	126	123	371	—	—	—	36·0?	—	78·7?	68·9?	114·3?	9·8?	55·4
135·5	96·4	—	103·5	103·0	134	113	130	376	522?	316	307·5	36·3	—	77·3?	74·9	103·3?	2·5?	56·5
132·5	98·1	114·0	110·8	88·9	134·5	123	108·5	366	522?	328?	321?	33·0?	—	84·0?	74·4	112·8?	9·6?	58·6
138·5	104·3?	122·2?	116·8	98·1	—	129·5	114	—	—	—	—	31·7	27·1	—	72·9	—	—	63·5
131	96·2	110·5	97·5	95·0	125·5	110	113·5	349	505	311	301	41·1	34·3	83·1	76·2	109·2	7·0	60·4
136	102·4	102·2	107·6	101·6	115	121	125	361	508	307	297·5	38·4	31·4	79·6	75·1	105·9	4·4	58·1
134	98·2	108·1	109·7	93·0	124	125	110	360	489?	—	—	33·2	28·3	78·5	77·9	100·9	0·6	61·4
137·5	—	—	111·2	92·8	—	124	110	—	511	325	314·5	36·5	34·0	84·0	78·8	106·5	5·2	61·2
132?	95·1?	107·0	107·8	91·1	122	121·5	107	351	—	313?	302·5?	36·1	32·2	85·2	78·1?	109·1?	7·1?	62·1
139·5	—	108·3	116·0	99·1	121·5?	128·5	116·5	367	509	323	310·5	35·5	30·9	83·2?	79·5?	104·7	3·7?	62·1
132·5	—	—	115·4	88·1	—	133	108	—	—	—	—	39·7	—	81·0	74·0	109·4	7·0	58·3
131?	98·1	112·5	112·3	91·0	130·5	126·5	113	370	—	—	—	35·0?	—	82·9	73·4?	113·0?	9·5?	57·4
137	107·1	115·8	114·7	99·2	131·5	125·5	123	380	531	323	312	33·7	29·4	75·6	71·9	105·1	3·7	57·5
132	101·2	111·1	110·1	98·1	126	121	114	361	518?	—	—	35·0	26·5	84·7	74·6	113·6	10·2	63·5
143	104·1	114·0	119·1	102·0	128	135·5	120	383	523	323	317	35·4	31·9	83·0	78·6	105·6	4·4	62·1
139	106·8	113·7	118·1	100·9	132	130	124	386	542	323	315·5	37·2	30·7	71·6	71·6	100·0	0·0	58·1
132	100·8	106·3	104·0	99·1?	119	114	123?	356	512	304	291	36·7	33·0	80·3	74·2	108·3	6·2	57·5
132	98·9	118·6	109·7?	95·0	135	—	109	—	506	333	324	37·0	27·7	82·3	72·9	112·9	9·4	65·4
124	100·9	108·9	101·1	107·9	122·5	110·5	134	367	519	—	—	36·8	29·2	78·8	67·4	116·9	11·4	57·4
131	100·1	—	103·6	94·8	121·5?	115	110	347?	—	—	—	34·8	29·1	84·6	75·9	111·5	8·7	63·8
124	103·9	105·1	107·5	95·1	119	116	117	352	—	—	—	37·1	—	75·5?	66·7	113·3?	8·9?	58·1
125·5	99·2	109·6	102·9	100·8	124·5	113	118	356	511	301	289·5	36·6	—	84·3	70·5	119·5	13·8	62·6
140	104·5	116·0	114·4	98·7	135	128·5	118	383	533	317	306·5	38·4	32·5	73·1	73·1	100·0	0·0	60·3
140·5	99·6	117·8	114·6	99·8?	134·5	130	114·5?	379	517	330	320·5	33·7	26·2	84·7	78·1	108·5	6·6	65·4
130	99·2	110·6	103·9	99·1	126	118	119	363	521	327	319	34·8	31·1	85·6	73·4	116·5	12·1	59·9
131	98·2	98·2	114·2	91·0	110	130	108	348	487?	—	—	35·7	29·9	76·2	76·2	100·0	0·0	61·0
131	—	108·3	115·2	93·3	123	128·5	111·5	363	—	307	298	31·3	28·2	79·7	74·0	107·6	5·7	60·4
128·5	98·0	109·8	110·3	97·1	123	122	121	366	—	301	285	36·7	29·9	75·6	70·4	107·4	5·2	57·2
130	98·3	112·0	100·0	102·3	122·5	—	118·5	—	516	336	325	35·7	30·0	90·4?	75·8	119·2?	14·6	64·0
138·5	102·0	111·1	119·8	98·1	125	134	120	379	—	—	—	35·2	28·8	—	74·3	—	—	58·5
125·5	95·2	104·3	119·4	97·4	122·5	132	119·5	374	515	295	289	33·5	31·2	73·2	68·6	106·8	4·6	58·2
131	103·0	105·3	106·9	94·1	118·5	120	115	354	506	294	287	35·1	27·4	73·6	72·0	102·3	1·6	58·5
128	—	—	106·6	101·2	—	115	123·5	—	—	—	—	36·8	31·8	78·7	69·0	114·1	9·7	58·6
134	103·3	109·8	117·3	99·7	121	130	114	365	515	309	298	38·2	30·8	74·9	72·4	103·4	2·4	66·0
133	99·7	120·0	117·6	97·1	135	132·5	115	383	—	—	—	36·8	28·7	77·8?	71·1	109·4?	6·7?	61·3
129	—	—	103·6	95·5	—	114·5	117	—	—	—	312·5	31·6	—	—	—	115·1	—	58·4
135	—	—	107·3	101·1	—	116·5	123·5	—	—	343	336	36·0	29·1	—	—	114·1	—	58·6
132	101·2	107·6	104·5	90·0	121	119·5	104·5	345	—	—	—	35·1	31·6	—	76·1	—	—	63·6
133	107·0	107·5	111·0	87·1	117·5	127	105	350	—	—	—	33·1	28·9	—	76·2	—	—	59·6
139	114·6	107·6	111·3	91·9	120	121	112	353	—	—	—	37·2	30·8	—	74·5	—	—	58·7
128·5	101·6	101·6	105·7	93·9	120·5	120	108	349	505	305	296	37·2	27·9	80·5	73·9	108·9	6·6	65·0
122	97·6	108·2	97·4	85·6	123·5	110·5	98	332	498	315	305·5	35·2	—	84·2	72·8	115·6	11·3	65·7
138·5	105·7	115·2	107·7	97·7	130	120	118	368	526	329	320·5	37·6	30·3	83·6	75·7	110·5	7·9	59·4
137	102·2	117·5	126·7	92·2?	138·5	142	111?	392	533	330	317·5	36·7	30·4	76·5	72·5	105·5	4·0	59·7
127	103·2	111·6	116·5	90·0	128·5	130	108	367	—	—	—	33·7	27·0	77·7	68·3	113·8	9·4	60·0
136	—	109·0	111·6	103·1	123·5	122·5	121	367	—	318	306	32·4	—	79·8	77·3	103·3	2·5	62·2
127·5	94·1	113·0	105·5	95·8	131	114	115	360	—	—	—	38·9	31·5	76·0	71·2	106·7	4·7	60·0
137	—	—	107·8	99·2?	—	120	121?	—	—	323?	314·5	39·9	—	—	—	112·4	—	58·0
133	—	—	105·6	92·2	—	120·5	108	—	—	324	314	32·8	28·1	—	—	109·0	—	62·0

$\frac{100\ (B-H')}{L}$	*Oc. I.*	$\frac{100\ fmb}{fml}$	
13·6	54·2?	—	Sagittal suture closed, lambdoid and coronal closing. Bipartite os
12·8	58·4	75·7	One or more wormians in lambdoid suture R. Ossicle of λ.
8·7	56·5	78·1	Numerous wormians in lambdoid suture R. Epipteric bones R. a
3·1	62·1	72·6	Precondyle R. Epipteric bone R.
4·1?	57·6	76·9	All sutures closing. JR.
4·7?	62·3	79·2	Ageing; sagittal suture partly obliterated, coronal and lambdoid c
10·2?	58·3	87·9	All sutures closing. Wormian in lambdoid L.
3·6	60·0	75·7	Aged; all sutures nearly obliterated. JL.
—	59·8	74·0	Wormians in lambdoid suture R. and L. JR. Epipteric bones R.
—	60·2	82·8	Wormians in lambdoid suture R. and L. J=.
5·1	59·2	79·7?	Ageing; sagittal suture closed, coronal and lambdoid nearly closed
0·6?	63·0	81·9	Sagittal suture closed, coronal and lambdoid closing. Wormians in
1·1	58·6	79·1	Wormians in lambdoid suture R. and L. Tympanic perforation R.
5·8	61·6	97·6	All sutures beginning to close. JR. Asymmetrical.
—	58·4?	76·2	All sutures closing. Precondyles.
10·7?	57·8?	73·6?	Ageing; sagittal suture quite and lambdoid partly obliterated. Co
4·3	58·1	91·1	Wormians in lambdoid suture R. and L. Ossicles of λ and at aste
7·5	61·8	85·6	Sagittal suture closed, lambdoid closing, coronal beginning to clos
7·1	59·9	89·2	All sutures closing. Wormians in lambdoid R. and L. Epipteric b
8·2	62·1	90·1	Tympanic perforation R. and L. JL.
8·9?	56·5	78·8	Metopic LF + RP 9 mm. J=.
9·8?	55·4	—	All sutures closing.
2·5?	56·5	—	Sagittal suture closing. Wormians in lambdoid R. and L.
9·6?	58·6	—	Ageing; sagittal suture obliterated, coronal and lambdoid closing.
—	63·5	85·5	Ageing; sagittal suture partly obliterated, coronal and lambdoid r
7·0	60·4	83·5	Sagittal suture closing, coronal and lambdoid beginning to close Epipteric bones R. and L. JR. Jugular foramen R. divided.
4·4	58·1	81·8	Sagittal suture partly obliterated. Precondyle R.
0·6	61·4	85·2	Wormians in lambdoid suture L. Irregular border of foramen ma
5·2	61·2	93·2	Sagittal and lambdoid sutures closing. Wormians in lambdoid L.
7·1?	62·1	89·2	Ageing; sagittal suture nearly obliterated, coronal and lambdoid
3·7?	62·1	87·0	Wormians in lambdoid suture R. and L. Wound on parietal bone
7·0	58·3	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid
9·5?	57·4	—	Aged; sagittal and lambdoid sutures partly obliterated, coronal c
3·7	57·5	87·2	Aged; sagittal suture quite and lambdoid partly obliterated, coro
10·2	63·5	75·7	All sutures closing. Numerous wormians in lambdoid R. and L.
4·4	62·1	90·1	Wormians in lambdoid suture R. Ossicle of λ.
0·0	58·1	82·5	Sagittal suture closed, lambdoid and coronal closing. Wormians in
6·2	57·5?	89·9	Aged; sagittal and lambdoid sutures nearly obliterated, coronal c
9·4	65·4	74·9	Aged; all sutures nearly obliterated. J=.
11·4	57·4	79·3	
8·7	63·8	83·6	Metopic suture meeting sagittal at bregma.
8·9?	58·1	—	Ageing; sagittal suture nearly obliterated, lambdoid and coronal
13·8	62·6	—	Aged; all sutures nearly obliterated. Small exostosis on parietal
0·0	60·3	84·6	All sutures closing. Asymmetrical. Projecting occiput. Large pr
6·6	65·4?	77·7	Aged; sagittal and lambdoid sutures obliterated, coronal closed.
12·1	59·9	89·4	Numerous wormians in lambdoid suture R. and L.
0·0	61·0	83·8	Wormians in lambdoid suture R. and L. J=. Traces of sutures b
5·7	60·4	90·1	Aged; all sutures obliterated. J=. Asymmetrical.
5·2	57·2	81·5	Aged; all sutures nearly obliterated. Wormians in lambdoid R. a
14·6	64·0	84·0	Aged; coronal and lambdoid sutures nearly obliterated. Tympan
—	58·5	81·8	Wormians in lambdoid suture R. and L. Large ossicle of λ.
4·6	58·2	93·1	Sagittal and coronal sutures nearly closed. Wormians in lambdoi of sutures between ex- and supra-occipitals R. and L.
1·6	58·5	78·1	Complex sutures. Metopic RF + LP 5·5 mm. Epipteric bones R.
9·7	58·6	86·4	All sutures closing. Large wormian in lambdoid R., small worm
2·4	66·0	80·6	Sagittal suture closed, lambdoid and coronal closing. Tympanic p
6·7?	61·3	78·2	Sagittal suture closed, lambdoid and coronal closing. Spine proj
—	58·4	—	Aged; sagittal and lambdoid sutures partly obliterated, coronal c
—	58·6	80·8	Ageing; all sutures nearly closed. Small ossicle of λ. Small prec
—	63·6	90·0	Wormian in lambdoid suture L. Basal suture not obliterated.
—	59·6	87·3	Wormians in lambdoid suture R. and L. Ossicle at asterion L.
—	58·7	82·8	
6·6	65·0	75·0	Ageing; sagittal suture closed, lambdoid and coronal closing. Me
11·3	65·7	—	Sagittal suture closing, lambdoid beginning to close.
7·9	59·4	80·6	Ageing; sagittal suture obliterated, lambdoid closed, coronal ope
4·0	59·7?	82·8	Aged; all sutures nearly obliterated. JR. Wound on temporal s
9·4	60·0	80·1	Aged; all sutures obliterated. Small precondyle L. JR.
2·5	62·2	—	Ageing; sagittal suture closed, coronal nearly closed, lambdoid o
4·7	60·0	81·0	Wormians in lambdoid suture R. and L. Ossicle in sagittal at o
—	58·6?	—	Aged; all sutures obliterated.
—	62·6	85·7	Sagittal suture closing. Epipteric bones R. and L. JR.

Remarks
Sagittal suture closed, lambdoid and coronal closing. Bipartite *os épactal*. Bathrocephalic.
One or more wormians in lambdoid suture R. Ossicle of λ.
Numerous wormians in lambdoid suture R. Epipteric bones R. and L. JR.
Precondyle R. Epipteric bone R.
All sutures closing. JR.
Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. JR. Division of jugular foramen R.
All sutures closing. Wormian in lambdoid L.
Aged; all sutures nearly obliterated. JL.
Wormians in lambdoid suture R. and L. JR. Epipteric bones R. and L. Tympanic perforation R. and L.
Wormians in lambdoid suture R. and L. J=.
Ageing; sagittal suture closed, coronal and lambdoid nearly closed. JR.
Sagittal suture closed, coronal and lambdoid closing. Wormians in lambdoid R. and L.
Wormians in lambdoid suture R. and L. Tympanic perforation R. and L. JL.
All sutures beginning to close. JR. Asymmetrical.
All sutures closing. Precondyles.
Ageing; sagittal suture quite and lambdoid partly obliterated. Coronal suture nearly closed. JR. Flattening at obelion.
Wormians in lambdoid suture R. and L. Ossicles of λ and at asterion L. Ossicle of bregma. Metopic. Small epipteric bone L. JR. Precondyles.
Sagittal suture closed, lambdoid closing, coronal beginning to close.
All sutures closing. Wormians in lambdoid R. and L. Epipteric bone R. JL.
Tympanic perforation R. and L. JL.
Metopic LF + RP 9 mm. J=.
All sutures closing.
Sagittal suture closing. Wormians in lambdoid R. and L.
Ageing; sagittal suture obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L.
Ageing; sagittal suture partly obliterated, coronal and lambdoid nearly closed.
Sagittal suture closing, coronal and lambdoid beginning to close. Wormians in lambdoid R. and L. Ossicle of λ and ossicle in sagittal suture. Epipteric bones R. and L. JR. Jugular foramen R. divided. Asymmetrical.
Sagittal suture partly obliterated. Precondyle R.
Wormians in lambdoid suture L. Irregular border of foramen magnum.
Sagittal and lambdoid sutures closing. Wormians in lambdoid L. and ossicle at asterion L. J=.
Ageing; sagittal suture nearly obliterated, coronal and lambdoid closing. Tympanic perforation R. J=.
Wormians in lambdoid suture R. and L. Wound on parietal bone L.
Ageing; sagittal suture partly obliterated, coronal and lambdoid closed.
Aged; sagittal and lambdoid sutures partly obliterated, coronal closed.
Aged; sagittal suture quite and lambdoid partly obliterated, coronal closed. J=. Asymmetrical.
All sutures closing. Numerous wormians in lambdoid R. and L. Precondyle L. JR.
Wormians in lambdoid suture R. Ossicle of λ.
Sagittal suture closed, lambdoid and coronal closing. Wormians in lambdoid R. and L. JL.
Aged; sagittal and lambdoid sutures nearly obliterated, coronal closed. Wormians in lambdoid R. and L. JL.
Aged; all sutures nearly obliterated. J=.
—
Metopic suture meeting sagittal at bregma.
Ageing; sagittal suture nearly obliterated, lambdoid and coronal closed. Flattening at obelion.
Aged; all sutures nearly obliterated. Small exostosis on parietal bone L.
All sutures closing. Asymmetrical Projecting occiput. Large precondyles. J=.
Aged; sagittal and lambdoid sutures obliterated, coronal closed. JR.
Numerous wormians in lambdoid suture R. and L.
Wormians in lambdoid suture R. and L. J=. Traces of sutures between ex- and supra-occipitals R. and L.
Aged; all sutures obliterated. J=. Asymmetrical.
Aged; all sutures nearly obliterated. Wormians in lambdoid R. and L.
Aged; coronal and lambdoid sutures nearly obliterated. Tympanic perforation R. and L. J=.
Wormians in lambdoid suture R. and L. Large ossicle of λ.
Sagittal and coronal sutures nearly closed. Wormians in lambdoid L. Ossicle of λ. Metopic LF + RP 5 mm. 3 small epipteric bones L. J=. Traces of sutures between ex- and supra-occipitals R. and L.
Complex sutures. Metopic RF + LP 5·5 mm. Epipteric bones R. and L. JR. Asymmetrical occiput.
All sutures closing. Large wormian in lambdoid R., small wormian in lambdoid L. Ossicle at asterion R.
Sagittal suture closed, lambdoid and coronal closing. Tympanic perforation R. Low median sagittal ridge.
Sagittal suture closed, lambdoid and coronal closing. Spine projecting posterior to bregma. Wound on frontal bone.
Aged; sagittal and lambdoid sutures partly obliterated, coronal closed. JR. Teeth moderately worn. Mandible; 4 teeth lost before death.
Ageing; all sutures nearly closed. Small ossicle of λ. Small precondyles. JL.
Wormian in lambdoid suture L. Basal suture not obliterated.
Wormians in lambdoid suture R. and L. Ossicle at asterion L. Slight tympanic perforation L. Excrescence posterior to basion.
—
Ageing; sagittal suture closed, lambdoid and coronal closing. Metopic LF + RP 3·5 mm. JL.
Sagittal suture closing, lambdoid beginning to close.
Ageing; sagittal suture obliterated, lambdoid closed, coronal open. Precondyle R. JR.
Aged; all sutures nearly obliterated. JR. Wound on temporal squama R.
Aged; all sutures obliterated. Small precondyle L. JR.
Ageing; sagittal suture closed, coronal nearly closed, lambdoid open.
Wormians in lambdoid suture R. and L. Ossicle in sagittal at obelion. Metopic LF + RP. JL.
Aged; all sutures obliterated.
Sagittal suture closing. Epipteric bones R. and L. JR.

No.	Sex	*IOW*	*B′*	*B″*	*B*	*Bias-terionic B*	*F*	*L*	*LB*	S_1'	S_2'	S_3'	S_1	S_2	S_3	*fml*	*fmb*
7	♂?	97	98·1	—	162	—	175	178	—	115·0	107·1	—	132·5	121·5	—	—	—
17	,,	—	—	—	135	—	177	178	—	106·1	113·0	—	119·5	125·5	—	—	—
125	,,	—	—	—	141	112?	183?	187	—	—	123·1	92·9?	—	136	112?	—	—
132	,,	—	—	—	146·5	118	174·5	179	—	—	114·1	97·2	—	130	117·5	—	—
143	,,	—	—	—	—	—	179	180·5	—	115·1	116·9	—	133	117	—	—	—
145	,,	—	—	—	—	111?	179	181	100·8	107·6	107·9	—	122·5	121	—	—	—
150	,,	—	—	—	—	—	—	185·5	—	117·4	113·6	—	135	130	—	—	—
162	,,	—	—	—	—	113	—	—	—	—	119·9	103·4	—	134·5	127	35·3	30·2
166	,,	—	—	—	—	—	—	—	—	—	121·8	93·9	—	136?	115	41·0	34·5
234	,,	97	99·0	119·5	143	—	181	185	—	—	106·0	102·9	—	114·5	124	—	—
236	,,	—	—	—	142	—	181	184·5	—	—	108·5	93·5	—	120·5	114	—	—
242	,,	98	103·9	128	142·5	—	182·5	183	—	108·6	119·0	—	127	134·5?	—	—	—
248	,,	—	—	—	—	—	182·5	185	—	113·6	113·6	—	131	129·5	—	—	—
251	,,	—	—	—	—	—	186	190	—	109·5	114·1	—	121·5	127·5	—	—	—
252	,,	—	94·0?	—	—	—	177·5	180	—	—	109·1	—	—	123·5	—	—	—
265	,,	96·5	96·9	—	—	—	175	178	—	109·7?	115·8	—	—	132	—	—	—
316	,,	96·5	100·9	—	152·5	—	172	175·5	—	111·3	114·2	—	126	136	—	—	—
323	,,	101	103·1?	—	151?	—	189	190·5	—	115·9	120·0	—	133	133	—	—	—
327	,,	—	101·1	—	130	—	171	174	—	—	108·8	93·1	—	121·5	108	—	—
328	,,	—	—	—	145	—	187·5	188	—	—	119·3	97·0	—	129·5	121·5	—	—
330	,,	—	93·1	—	140	—	177	183?	—	—	108·2	97·0	—	121	120	—	—
338	,,	—	99·1	—	136?	—	173	178·5	—	—	108·2	—	—	121	—	—	—
353	,,	—	—	—	—	—	—	162	—	113·1	101·3	—	131·5	116	—	—	—
357	,,	—	100·1	—	140·5?	—	188·5	191	—	109·1	113·0	—	123	128	—	—	—
359	♂	100	95·2	—	—	—	174·5	179·5	—	106·0	108·8	—	117	—	—	—	—
369	♂?	—	—	—	—	—	165	166?	—	121·4	109·8	—	139·5?	124	—	—	—
372	,,	—	96·0	—	—	—	—	184?	—	115·0	—	—	130·5	122	—	—	—
376	,,	—	—	—	—	—	175	175?	—	—	—	96·2?	—	—	112?	—	—
377	,,	97	101·9	—	—	—	176·5?	180?	—	112·1	115·0	—	128	131·5	—	—	—
378	,,	—	—	—	—	—	176	180?	—	107·0	116·3	95·3	—	—	112·5	—	—
438	,,	—	99·1	—	152?	—	—	175?	—	—	—	—	126?	—	—	—	—
441	,,	96	94·0	121	138	—	176·5	181	—	109·3	112·4	—	123	126·5	—	—	—
471	,,	—	—	—	147	—	—	—	—	—	—	89·1	—	—	105	37·7	—
476	,,	—	—	126?	143·5?	—	176	—	—	—	103·0	—	—	113	—	—	—
477	,,	97	98·1	126?	144	—	—	181?	—	117·2	115·0	—	139·5	131	—	—	—
485	,,	—	—	—	—	—	—	189	—	118·3	106·5	—	135	115	—	—	—
487	,,	100·5	99·0	—	—	—	—	184	—	114·2	106·0	—	129	116	—	—	—
495	,,	—	95·1	—	—	—	171	174	—	108·1	105·0	—	122	112·5	—	—	—
531	,,	99	98·6	—	144	—	173·5	177	—	106·0	107·0	—	119	120·5	—	—	—
542	,,	—	—	—	148·5?	—	187	191	—	110·0	112·2	—	125·5	139·5	—	—	—
573	,,	—	—	—	146	119	—	—	—	—	—	95·8	—	—	114	38·5	33·1
578	,,	—	—	—	—	—	176·5	176	—	106·9	108·3	—	130	124	—	—	—
593	,,	—	—	—	156	117·5?	—	—	—	—	—	97·1	—	—	116	41·0	33·1
633	,,	—	—	—	133·5	—	—	173	—	—	105·8	88·4	—	120	108	—	—
642	,,	—	—	—	150	—	191·5	194	—	115·3?	126·5	—	—	143	—	—	—
643	,,	—	—	—	143	—	192·5	192	—	—	119·2?	95·0	—	—	112	—	—
655	,,	99·5	91·9	120·5	—	—	176	183	—	—	115·4	—	121·5	130	—	—	—
661	,,	—	—	—	—	—	176	178·5	—	107·5	101·2	—	123	111	—	—	—
662	,,	—	—	—	—	—	182	188	—	113·3	113·3	94·9	—	125	110	—	—
716	,,	97·5	96·9	120	141·5	105?	177	179	—	—	115·3	87·2	—	130·5	108·5	—	—
757	,,	—	—	—	—	—	166	168	—	—	—	—	—	—	—	—	—
761	,,	96?	93·9	123·5?	—	—	170	169	—	—	—	101·8	—	—	121	—	—
770	,,	—	—	—	134	108·5?	—	—	—	—	—	96·0	—	117	112·5	36·8	32·3
782	,,	—	—	133·5	—	—	—	—	—	—	105·6	97·7	—	120·5	118	31·3	32·0
785	,,	—	—	—	—	—	—	184·5?	—	—	110·0	113·2	123	124·5?	—	—	—
807	,,	97·5	92·4	112?	138	—	177·5	183	—	112·8	111·4	—	123·5	123·5	—	—	—
823	,,	—	—	—	149	112?	—	179?	—	—	109·6	92·5	—	124·5	112	—	—
828	,,	101·5	99·2	126	139	112?	178	179	—	109·5	111·3	—	122·5	125	—	—	—
837	,,	—	—	—	—	—	—	—	—	—	114·5	93·1	—	126	112	34·7	29·4
846	,,	—	—	—	149·5	114	—	—	—	—	—	96·3	—	—	117	35·0	26·8

S_1	S_2	S_3	*fml*	*fmb*	$\frac{100\ B}{L}$	*Oc. I.*	$\frac{100\ fmb}{fml}$	
132·5	121·5	—	—	—	91·0	—	—	Ageing; sagittal suture closed, coronal clo
119·5	125·5	—	—	—	75·8	—	—	Ageing; sagittal suture closed, coronal an
—	136	112?	—	—	75·4	59·6?	—	Ageing; sagittal and lambdoid sutures par
—	130	117·5	—	—	81·8	59·4	—	Sagittal and coronal sutures closing. Ossi
133	117	—	—	—	—	—	—	Sagittal and lambdoid sutures closing, cor
122·5	121	—	—	—	—	—	—	Ageing; sagittal and coronal sutures nearl
135	130	—	—	—	—	—	—	Wormians in lambdoid suture L.
—	134·5	127	35·3	30·2	—	58·2	85·6	Sagittal and lambdoid sutures closing. Wo
—	136?	115	41·0	34·5	—	58·4	84·1	Sagittal suture partly obliterated, lambdo
—	114·5	124	—	—	77·3	59·6	—	Ageing; sagittal and lambdoid sutures clo
—	120·5	114	—	—	77·0	58·7	—	Ageing; sagittal suture nearly obliterated,
127	134·5?	—	—	—	77·9	—	—	Ageing; sagittal suture quite and lambdoi
131	129·5	—	—	—	—	—	—	Sagittal and coronal sutures beginning to
121·5	127·5	—	—	—	—	—	—	Sagittal suture closed, lambdoid and coron
—	123·5	—	—	—	—	—	—	Sagittal suture partly obliterated, lambdo
—	132	—	—	—	—	—	—	Sagittal and coronal sutures closing. Worn
126	136	—	—	—	86·9	—	—	Sagittal suture partly obliterated, lambdo
133	133	—	—	—	79·3?	—	—	Sagittal suture closed, coronal closing. Wo
—	121·5	108	—	—	74·7	63·8	—	Sagittal suture partly obliterated, lambdo
—	129·5	121·5	—	—	77·1	56·9	—	Wormians in lambdoid suture R. and L.
—	121	120	—	—	76·5?	57·7	—	Ossicle of λ.
—	121	—	—	—	76·2?	—	—	Sagittal suture closing. Wormians in lamb
131·5	116	—	—	—	—	—	—	Wormians in lambdoid suture R. and L.
123	128	—	—	—	73·6?	—	—	Ageing; sagittal suture partly obliterated,
117	—	—	—	—	—	—	—	Sagittal suture partly obliterated, lambdoi
139·5?	124	—	—	—	—	—	—	Sagittal suture closed, lambdoid beginning
130·5	122	—	—	—	—	—	—	Sagittal suture closing.
—	—	112?	—	—	—	63·3?	—	Aged; sagittal and lambdoid sutures oblit
128	131·5	—	—	—	—	—	—	Wormians in lambdoid suture R.
—	—	112·5	—	—	—	61·7	—	Ageing; sagittal suture partly obliterated,
120?	—	—	—	—	87·9?	—	—	Metopic LF + RP.
123	126·5	—	—	—	76·7	—	—	Ageing; sagittal suture partly obliterated,
—	—	105	37·7	—	—	61·9	—	Aged; sagittal and lambdoid sutures oblit
—	113	—	—	—	—	—	—	Ageing; sagittal and coronal sutures close
139·5	131	—	—	—	79·6	—	—	All sutures closing. Epipteric bone L.
135	115	—	—	—	—	—	—	Aged; all sutures nearly obliterated.
129	116	—	—	—	—	—	—	Aged; sagittal suture obliterated, coronal
122	112·5	—	—	—	—	—	—	Wormians in lambdoid suture R. and L.
119	120·5	—	—	—	81·4	—	—	All sutures closing. Numerous wormians i
125·5	139·5	—	—	—	77·7?	—	—	Ageing; all sutures nearly closed. Wormia
—	—	114	38·5	33·1	—	60·8	86·0	Aged; all sutures obliterated. Small holes
130	124	—	—	—	—	—	—	Sagittal and lambdoid sutures closing. Wo
—	—	116	41·0	33·1	—	60·4	80·7	Sagittal suture closed, lambdoid closing.
—	120	108	—	—	77·2	58·5	—	Sagittal suture partly obliterated, lambdo
—	143	—	—	—	77·3	—	—	Sagittal and lambdoid sutures closing. Wo
—	—	112	—	—	74·5	61·8	—	Sagittal and lambdoid sutures closing. Pr
121·5	130	—	—	—	—	—	—	Sagittal suture closing. Wormians in lamb
123	111	—	—	—	—	—	—	Sagittal suture closed, lambdoid and coron
—	125	110	—	—	—	63·9	—	Ageing; sagittal suture closed, lambdoid a
—	130·5	108·5	—	—	79·1	57·3	—	Aged; all sutures nearly obliterated. Worn
—	—	—	—	—	—	—	—	Aged; sagittal suture obliterated, lambdoi
—	—	121	—	—	—	60·9	—	Sagittal suture closing. Wormian in lambd
—	117	112·5	36·8	32·3	—	62·4	87·8	Wormians in lambdoid R. Tympanic perfo
—	120·5	118	31·3	32·0	—	59·4	102·2	Ageing; sagittal suture partly obliterated,
123	124·5?	—	—	—	—	—	—	
125·5	123·5	—	—	—	75·4	—	—	Sagittal suture beginning to close.
—	124·5	112	—	—	83·2?	59·2	—	Sagittal suture closing. Wormian in lambd
122·5	125	—	—	—	77·7	—	—	Ageing; sagittal suture partly obliterated,
—	126	112	34·7	29·4	—	59·8	84·7	Sagittal suture closing. Epipteric bone L.
—	—	117	35·0	26·8	—	59·0	76·6	Sagittal and lambdoid sutures closing. Po

lete Male Calvariae.

Remarks
losed, coronal closing. Metopic RF + LP 8 mm.
losed, coronal and lambdoid closing. Wormian in lambdoid R.
bdoid sutures partly obliterated, coronal closing.
res closing. Ossicle of λ.
tures closing, coronal open. Wormians in lambdoid R. and L.
nal sutures nearly obliterated, lambdoid closed. Wormians in lambdoid R. Fused atlas.
ıture L.
tures closing. Wormians in lambdoid R. and L. JL.
iterated, lambdoid and coronal beginning to close.
bdoid sutures closing, coronal beginning to close. Large wormian in lambdoid R.
early obliterated, coronal closing, lambdoid beginning to close.
nite and lambdoid nearly obliterated, coronal closed.
res beginning to close. Ossicle at asterion R.
mbdoid and coronal nearly closed. Asymmetrical. Markedly retreating frontal bone.
iterated, lambdoid closing, coronal beginning to close.
res closing. Wormians in lambdoid R. and L. Ossicle of λ and ossicle in sagittal suture at obelion.
iterated, lambdoid closing.
ronal closing. Wormians in lambdoid R. and L. Interparietal os triangulare R.
iterated, lambdoid and coronal closing. Large wormian in lambdoid L.
ıture R. and L.
Vormians in lambdoid R. and L. Tympanic perforation L.
ıture R. and L. Metopic. Epipteric bone L.
artly obliterated, lambdoid closed, coronal closing.
iterated, lambdoid and coronal closing. Several teeth lost before death.
mbdoid beginning to close.
oid sutures obliterated, coronal closing.
ıture R.
artly obliterated, coronal and lambdoid closed.
artly obliterated, coronal and lambdoid closing. Wormian in lambdoid R. Large epipteric bone L.
oid sutures obliterated. Prominent post-glenoid processes.
nal sutures closed, lambdoid closing. Asymmetrical.
teric bone L.
obliterated.
iterated, coronal and lambdoid closed. Wormians in lambdoid R. and L.
ıture R. and L. Asymmetrical.
erous wormians in lambdoid R. and L.
closed. Wormian in lambdoid L. Projecting occiput.
ted. Small holes in bones of vault and base due probably to post-mortem injury.
tures closing. Wormians in lambdoid R. and L.
mbdoid closing. Numerous wormians in lambdoid R. and L. Ossicle at asterion R. Epipteric bone L. JR.
iterated, lambdoid closing. Wormians in lambdoid R. and L. Metopic LF + RP 3·5 mm.
tures closing. Wormians in lambdoid R. and L. Bipartite *os épactal* surrounded by numerous ossicles.
tures closing. Projecting occiput. Metopic.
Vormians in lambdoid L. and ossicle of λ.
mbdoid and coronal closing. Wormian in lambdoid L.
osed, lambdoid and coronal closing. Wormians in lambdoid R. and L. Ossicle of λ. Projecting occiput.
obliterated. Wormian in lambdoid R. Projecting occiput.
terated, lambdoid closed. Large healed wound (sword-cut?) on parietal L.
Vormian in lambdoid L.
. Tympanic perforation L.
artly obliterated, coronal and lambdoid closed. Asymmetrical.
to close.
Vormian in lambdoid R. Wound on L. parietal.
artly obliterated, lambdoid and coronal closing. Wormians in lambdoid R. and L.
Epipteric bone L. Large tympanic perforation L.
tures closing. Posterior wall of auricular passage R. defective (see Plate VI *d*).

No.	Sex	*IOW*	*B'*	*B''*	*B*	*Bias-terionic B*	S_1	S_2	S_3	S_1'	
59	♂?	—	—	—	138	110	—	123	101	—	1
61	,,	—	—	122	139	105·5	—	123	—	—	1
64	,,	—	—	—	140·5	111	—	139·5	113	—	1
69	,,	—	—	—	162	117	—	127	115	—	1
70	,,	—	—	—	—	120?	—	—	—	—	
78	,,	—	—	—	—	117	—	134·5	116	—	1
79	,,	—	—	—	—	112	—	130	110·5	—	1
88	,,	—	—	—	—	108·5	—	110·5	125	—	
148	,,	—	—	—	—	104	—	116	124·5	—	1
153	,,	—	—	—	148	—	—	115·5	—	—	1
156	,,	—	95·1	123·5	144?	—	131·5	—	—	114·1	
157	,,	—	—	—	153?	—	—	123	—	—	1
159	,,	—	—	—	150·5?	—	—	—	—	—	1
160	,,	—	—	—	147	106	—	—	116	—	
168	,,	—	—	—	—	113·5	—	123?	124	—	1
174	,,	—	—	—	—	—	—	120	115?	—	1
266	,,	—	—	—	139	—	—	118·5	—	—	
268	,,	—	—	—	145?	—	—	138?	—	—	1
270	,,	—	—	—	150?	110·5	—	128	—	—	
273	,,	—	—	—	—	—	—	146	116?	—	1
280	,,	—	—	—	—	—	—	131	117	—	
349	,,	—	—	133?	153·5?	—	—	118	114	—	1
352	,,	—	—	—	—	115	—	127·5	117·5	—	1
354	,,	—	—	—	149	—	—	—	107·5	—	
365	,,	—	—	—	152·5	—	—	—	—	—	
368	,,	—	—	—	144·5	—	—	—	—	—	
384	,,	—	—	—	—	—	—	118·5?	127?	—	1
388	,,	—	—	—	127	—	—	128	111	—	1
458	,,	—	—	129·5?	155	—	—	117	121	—	1
459	,,	—	—	—	—	109?	—	130?	123	—	1
478	,,	—	—	—	145	—	—	124	111	—	1
479	,,	—	—	—	150	—	—	129	120·5	—	1
480	,,	—	101·1	125·5?	143	—	139·5	129	—	120·0	1
484	,,	—	—	—	137?	—	—	110	115?	—	1
493	,,	—	—	—	—	—	—	122	113	—	1
563	,,	—	—	—	151	121?	—	132	120	—	1
566	,,	—	—	—	142?	—	—	125	113	—	
568	,,	—	—	—	—	—	—	128·5	117	—	1
571	,,	—	—	—	140	—	—	131	—	—	1
574	,,	—	—	122?	141	—	—	128	126	—	1
580	,,	—	—	—	146·5	—	—	119	106	—	1
581	,,	—	96·2	—	144	—	—	122?	—	—	1
584	,,	—	—	—	—	—	—	130	118	—	
587	,,	—	—	—	—	—	—	119	142	—	1
596	,,	—	—	—	—	—	—	131	116	—	
599 B	,,	104·5	106·1	133	157	—	—	—	—	—	
653	,,	—	95·7	—	147	—	—	113	120	—	1
657	,,	—	—	—	141	—	—	128·5	108	—	1
658	,,	99	101·0	126·5	147·5	—	122	122·5?	—	106·2	
683	,,	—	—	—	144?	—	—	—	—	—	
684	,,	—	—	—	137	—	—	130	117	—	1
686	,,	99	101·2	132	146?	—	131?	139?	—	113·6	
741	,,	99·5?	98·4	120	144·5	—	131·5	134·5	—	113·6	1
743	,,	—	—	—	144	—	—	124?	103	—	1
744	,,	95·5	89·4	—	140·5	—	121	107·5	—	104·2	
748	,,	—	—	—	—	—	—	129·5	113	—	1
755	,,	—	—	—	146·5	—	—	117·5	—	—	1
758	,,	—	—	120·5?	144	—	—	118	106	—	1
771	,,	100	99·9	—	162·5	—	—	128	—	—	1
780	,,	—	—	—	140?	—	—	—	—	—	
781	,,	—	—	—	157·5	—	—	124·5	108	—	1
839	,,	—	—	—	137	—	—	118·5	—	—	1
855	,,	—	—	—	—	113·5	—	115	131	—	1
860	,,	96	95·7	—	—	110?	118·5	117·5	—	105·2	1
865	,,	—	—	—	140	—	—	—	113	—	
867	,,	—	—	—	—	—	—	130	—	—	1
873	,,	—	—	—	143·5	110·5?	—	—	118	—	
877	,,	—	—	—	—	—	—	128	128	—	1
880	,,	—	—	—	—	107?	—	122	111	—	1
891	,,	—	—	—	—	—	—	130·5	108·5	—	

	S_1'	S_2'	S_3'	*Oc. I.*	Rem.
	—	107·3	86·6	63·1	Wormians in lambdoid suture R. and L.
	—	104·9	—	—	Sagittal suture closing, lambdoid and coronal beginning to close
	—	123·0	91·8	58·0	Sagittal and lambdoid sutures closing.
	—	112·8	96·4	60·5	Sagittal suture closed, lambdoid and coronal beginning to close.
	—	—	—	—	Sagittal suture closing, lambdoid beginning to close. Ossicles at
	—	120·1	98·0	61·3	Sagittal suture closed. Interparietal os triangulare R. and L.
5	—	115·3	95·2	63·6	Wormians in lambdoid suture L., ossicle of λ.
	—	99·1	104·8	60·5	Sagittal suture closing, lambdoid beginning to close. Depression
5	—	108·1	98·0	56·2	Aged; sagittal suture obliterated, lambdoid and coronal closed.
	—	107·8	—	—	Sagittal suture closing, coronal and lambdoid beginning to close
	114·1	—	—	—	Sagittal and coronal sutures closing. Wormians in lambdoid R.
	—	107·3	—	—	Ageing; sagittal and lambdoid sutures nearly closed. Wormian i
	—	114·8	—	—	Aged; sagittal suture nearly obliterated, lambdoid closed.
	—	—	96·8	60·2	Single wormians in lambdoid suture R. and L.
	—	110·0	100·4	57·8	Wormian in lambdoid suture R. Trace of metopic suture near b
?	—	109·7	96·1?	60·2?	Aged; sagittal suture quite and lambdoid partly obliterated. W
	—	—	—	—	Sagittal and lambdoid sutures beginning to close.
	—	121·7?	—	—	Ageing; sagittal suture partly obliterated, lambdoid closing. Wo
	—	—	—	—	Sagittal suture nearly obliterated at obelion, but open near breg
?	—	130·2	93·0?	57·2?	Ageing; sagittal suture obliterated, coronal and lambdoid nearly
	—	—	97·2	59·7	Sagittal suture obliterated at obelion, but open near bregma; la
	—	104·2	94·6	59·6	Wormians in lambdoid suture R. and L.
5	—	115·5	96·9	58·9	Sagittal and coronal sutures closing. Wormians in lambdoid R.
5	—	—	91·2	61·8	Aged; sagittal suture quite and lambdoid nearly obliterated. W
	—	—	—	—	Ageing; sagittal suture obliterated, lambdoid closed. Wormians
	—	—	—	—	Aged; sagittal suture quite and lambdoid nearly obliterated.
?	—	107·1?	106·1?	60·2?	Sagittal suture closing. Wormians in lambdoid R. and L.
	—	116·8	93·7	61·2	Ageing; sagittal and coronal sutures closed, lambdoid beginning
	—	108·1	101·1	60·2	Ossicles at lambda and asterion R.
	—	111·1	100·2	58·2	Ageing; sagittal suture partly obliterated, lambdoid closed, coro
	—	110·0	89·3	57·4	Tympanic perforation R.
5	—	116·1	93·9	55·8	Sagittal and lambdoid sutures closing. Numerous wormians in l
	120·0	115·7	—	—	
?	—	100·4	90·2	56·0?	Ageing; sagittal suture partly obliterated, coronal closed, lambd
	—	106·6	92·3	58·4	Wormian in lambdoid suture R.
	—	118·3	94·3	56·1	Sagittal suture partly obliterated, lambdoid and coronal closin Bathrocephalic. Small exostosis on frontal bone.
	—	—	94·1	59·9	Wormian in lambdoid suture R.
	—	114·7	95·2	58·1	
	—	115·0	—	—	Ageing; sagittal suture closed, lambdoid and coronal closing.
	—	113·5	102·9	58·4	Wormians in lambdoid suture R. and L.
	—	107·6	87·3	59·0	Wormian in lambdoid suture R.
	—	111·2?	—	—	Very prominent superciliary ridge.
	—	—	93·2	56·4	Sagittal suture closing, lambdoid beginning to close. Wormians
	—	111·9	112·2	56·4	Complex sutures. Wormians in lambdoid R. and L.
	—	—	97·9	61·2	Sagittal and lambdoid sutures closing.
	—	—	—	—	Coronal suture closing.
	—	100·2	100·3	60·3	Ageing; sagittal suture partly obliterated, coronal and lambdoid
	—	116·1	92·3	62·6	Aged; sagittal suture quite and lambdoid partly obliterated, co
	106·2	—	—	—	Coronal suture closing. Trace of metopic suture near bregma.
	—	—	—	—	Aged; sagittal suture obliterated, coronal closed.
	—	116·1	97·1	59·6	Aged; sagittal suture obliterated. Wormians in lambdoid R. and
	113·6	—	—	—	Sagittal suture closing.
	113·6	119·5	—	—	Sagittal suture closing, coronal beginning to close.
	—	107·5	89·3	64·6	
	104·2	96·1	—	—	Ageing; sagittal suture closed, lambdoid closing.
	—	114·2	89·1	56·3	Aged; all sutures obliterated. Bathrocephalic.
	—	104·0	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid
	—	106·2	88·1	59·8	
	—	112·5	—	—	Wormians in lambdoid suture L.
	—	—	—	—	Wormians in lambdoid suture R. and L. Projecting occiput wit
	—	107·0	88·1	58·3	Wormians in lambdoid suture R.
	—	108·5	—	—	Ageing; sagittal and coronal sutures closed.
	—	106·6	106·1	57·8	Ageing; sagittal suture nearly obliterated, coronal closed, lambd mastoid sutures open.
	105·2	107·1	—	—	Sagittal suture closing, lambdoid and coronal beginning to close
	—	—	94·2	60·0	Aged; sagittal suture quite, lambdoid partly obliterated. Large
	—	118·0	100·9	—	Ageing; sagittal suture obliterated, lambdoid closed, coronal clo
	—	—	93·5	56·5	Sagittal suture closed, lambdoid closing. Wormians in lambdoid
	—	114·0	106·2	59·6	Ageing; sagittal suture partly obliterated, lambdoid nearly close
	—	110·4	90·1	57·9	Sagittal and lambdoid sutures closing. Wormians in lambdoid L
5	—	—	91·2	60·8	Ageing; sagittal and lambdoid sutures closed.

	Remarks
	in lambdoid suture R. and L.
	ture closing, lambdoid and coronal beginning to close. Ossicle of λ.
	d lambdoid sutures closing.
	ture closed, lambdoid and coronal beginning to close.
	ture closing, lambdoid beginning to close. Ossicles at asteria.
	ture closed. Interparietal os triangulare R. and L.
	in lambdoid suture L., ossicle of λ.
	ture closing, lambdoid beginning to close. Depression at obelion.
	ttal suture obliterated, lambdoid and coronal closed. Wormians in lambdoid R.
	ure closing, coronal and lambdoid beginning to close. Wormians in lambdoid R. and L.
	l coronal sutures closing. Wormians in lambdoid R. and L. Wound on L. parietal.
	gittal and lambdoid sutures nearly closed. Wormian in lambdoid L.
	tal suture nearly obliterated, lambdoid closed.
	nians in lambdoid suture R. and L.
	lambdoid suture R. Trace of metopic suture near bregma.
	tal suture quite and lambdoid partly obliterated. Wormian in lambdoid L.
	l lambdoid sutures beginning to close.
	ittal suture partly obliterated, lambdoid closing. Wormians in lambdoid R. and L. Thin bones.
	ure nearly obliterated at obelion, but open near bregma; lambdoid clearly open. Wormian in lambdoid R.
	ttal suture obliterated, coronal and lambdoid nearly closed.
	ure obliterated at obelion, but open near bregma; lambdoid closing. Wormians in lambdoid R. and L.
	n lambdoid suture R. and L.
	coronal sutures closing. Wormians in lambdoid R. and L.
	al suture quite and lambdoid nearly obliterated. Wormians in lambdoid R. and L.
	ttal suture obliterated, lambdoid closed. Wormians in lambdoid R. and L. Interparietal os triangulare L.
	al suture quite and lambdoid nearly obliterated.
	re closing. Wormians in lambdoid R. and L.
	ttal and coronal sutures closed, lambdoid beginning to close. Wormians in lambdoid R. and L.
	mbda and asterion R.
	ttal suture partly obliterated, lambdoid closed, coronal closing. Flattening at obelion.
	rforation R.
	lambdoid sutures closing. Numerous wormians in lambdoid R. and L. Ossicles at lambda and asteria.
	tal suture partly obliterated, coronal closed, lambdoid nearly closed. Wormians in lambdoid R. and L. Ossicle of λ.
	lambdoid suture R.
	re partly obliterated, lambdoid and coronal closing. Wormians in lambdoid R. and L. Ossicles of λ and bregma.
	phalic. Small exostosis on frontal bone.
	lambdoid suture R.
	tal suture closed, lambdoid and coronal closing.
	lambdoid suture R. and L.
	ambdoid suture R.
	nt superciliary ridge.
	e closing, lambdoid beginning to close. Wormians in lambdoid suture R. and L. Bathrocephalic.
	res. Wormians in lambdoid R. and L.
	ambdoid sutures closing.
	closing.
	al suture partly obliterated, coronal and lambdoid nearly closed.
	suture quite and lambdoid partly obliterated, coronal closed.
	closing. Trace of metopic suture near bregma.
	suture obliterated, coronal closed.
	suture obliterated. Wormians in lambdoid R. and L. Exostosis on occipital bone.
	closing.
	closing, coronal beginning to close.
	l suture closed, lambdoid closing.
	es obliterated. Bathrocephalic.
	l suture partly obliterated, coronal and lambdoid closed.
	mbdoid suture L.
	mbdoid suture R. and L. Projecting occiput with massive inionic protuberance but thin walls.
	mbdoid suture R.
	l and coronal sutures closed.
	l suture nearly obliterated, coronal closed, lambdoid open. Temporals completely fused to parietals but occipito-
	ures open.
	closing, lambdoid and coronal beginning to close.
	uture quite, lambdoid partly obliterated. Large mastoid foramen R.
	suture obliterated, lambdoid closed, coronal closing. Wormians in lambdoid R. and L.
	closed, lambdoid closing. Wormians in lambdoid R. and L. Bathrocephalic.
	suture partly obliterated, lambdoid nearly closed. Wormian in lambdoid R.
	nbdoid sutures closing. Wormians in lambdoid L.
	and lambdoid sutures closed.

No.	Sex	*Bias-terionic B*	S_3	S_3'	*fml*	*fmb*	*Oc. I.*	$\frac{100\ fmb}{fml}$	REMARKS
65	♂?	109	111	97·0	31·3	27·3	65·8	87·2	Single wormians in lambdoid suture R. and L. JL.
66	,,	110·5	115·5?	94·0?	33·8	26·5	58·1?	78·4	Sagittal suture closed at obelion, lambdoid closing.
67	,,	104·5?	106	90·0	35·1	28·0	61·9	79·8	Aged; sagittal and lambdoid sutures nearly obliterated
68	,,	118?	—	—	37·8	29·6	—	78·3	Lambdoid suture closed. JL.
82	,,	—	107?	92·7?	—	—	64·5?	—	——
83	,,	122?	124·5?	100·1?	35·2?	—	57·3?	—	Aged; sagittal and lambdoid sutures nearly obliterated
93	,,	—	112	95·1	—	—	61·9	—	Lambdoid suture closing. Wormians R. and L.
95	,,	—	—	—	32·8	29·6	—	90·2	——
96	,,	—	125	104·7	—	—	60·5	—	Sagittal suture closed, lambdoid closing. Wormians in Small exostosis at obelion.
97	,,	107?	108·5?	90·1?	37·5	—	59·7?	—	Lambdoid suture closing. Tympanic perforation R.
184	,,	—	109·5	90·3	—	—	59·1	—	Aged; sagittal and lambdoid sutures almost oblite lambdoid R. and L.
187	,,	—	112	94·4	—	—	61·1	—	Sagittal suture closing, lambdoid beginning to close.
188	,,	—	—	—	30·5	26·6	—	87·2	——
190	,,	—	—	—	36·2	27·9	—	77·1	——
191	,,	—	125?	98·7?	31·2	26·2	56·4?	84·0	Precondyles.
193	,,	—	117·5?	95·7?	—	—	58·2?	—	Sagittal suture closing, lambdoid beginning to close. W R. and L.
261	,,	111?	123	100·1	33·7	28·0	58·1	83·1	Ageing; sagittal suture closed, lambdoid closing. Wo R. and L. JR.
278	,,	—	114	97·2	37·8	30·0	62·3	79·4	JL. Small precondyles.
282	,,	—	109	89·5	34·6	29·7	58·8	85·8	Sagittal suture closed, lambdoid closing.
291	,,	—	122?	99·1?	—	—	58·0?	—	Wormians in lambdoid suture R. and L.
379	,,	—	115	89·6	—	—	55·8	—	Aged; sagittal and lambdoid sutures obliterated. JR.
389	,,	—	106?	89·2?	—	—	61·0?	—	Aged; sagittal suture obliterated, lambdoid closed. W R. and L.
445	,,	—	115?	94·0?	—	—	58·5?	—	Aged; sagittal and coronal sutures obliterated.
454	,,	—	120	98·1	—	—	58·5	—	Ageing; sagittal suture closed, lambdoid closing.
455	,,	106·5?	105	88·0	31·7	27·8	60·5	87·7	Sagittal suture closed, lambdoid closing. Precondyle R
463	,,	—	110	93·0	—	—	61·4	—	Sagittal suture closing. Wormians in lambdoid L.
466	,,	—	102	89·2	—	—	66·0	—	Aged; sagittal and lambdoid sutures obliterated.
469	,,	—	117	97·6	—	—	60·1	—	Sagittal and lambdoid sutures nearly closed.
475	,,	—	118	98·3	34·2	32·3	60·0	94·4	Sagittal and lambdoid sutures closing. Epipteric bone
489	,,	—	127·5?	104·9?	—	—	59·0?	—	Lambdoid suture closed.
492	,,	—	117	98·1	35·7	32·7	60·5	91·6	Wormians in lambdoid suture and at asteria and lamb
498	♂?	—	108	92·9	—	—	63·4	—	Aged; sagittal and lambdoid sutures nearly oblite lambdoid R.
499B	,,	—	116	97·6	—	—	60·9	—	——
499E	,,	—	—	—	32·0	29·2	—	91·3	——
499G	,,	—	114	90·0	—	—	56·3	—	Aged; sagittal and lambdoid sutures closed. Interparie Wormians in lambdoid L.
499M	,,	—	105?	88·2?	—	—	60·8?	—	——
569	,,	—	118	91·6	—	—	55·6	—	Sagittal suture closed, lambdoid closing. Wormians i jecting occiput. Wound on R. parietal.
576	,,	—	118	96·9	37·5	30·8	58·8	82·1	Lambdoid suture closing, sagittal open. Numerous w R. and L. Asymmetrical.
586	,,	—	114	93·1	—	—	58·4	—	Ageing; sagittal and lambdoid sutures closed. Wo R. and L.
599C	,,	—	107?	88·2?	35·0	29·8	59·1?	85·1	Wormians in lambdoid suture R. Precondyle R.
599F	,,	—	125?	95·1?	—	—	54·9?	—	Lambdoid suture closing; numerous wormians R. and
599H	,,	—	117	95·2	—	—	58·1	—	Aged; sagittal and lambdoid sutures nearly obliterate
599K	,,	—	—	—	34·5	28·7	—	83·2	——
599M	,,	—	—	—	31·9	26·7	—	83·7	——
692	,,	—	118?	96·1?	31·9	25·3	58·2?	79·3	Lambdoid suture closing; wormians R. and at asteria.
699	,,	—	116?	92·8?	34·6	31·6	57·1?	91·3	——
752	,,	—	116	92·1	—	—	56·6	—	Aged; sagittal and coronal sutures obliterated, lambd
766	,,	—	131	110·0	—	—	60·7	—	Wormians in lambdoid suture R. and L.
768	,,	—	103·5	87·3	35·6	30·2	61·1	84·8	Aged; sagittal and lambdoid sutures closed. Ossicle o
769	,,	—	107	93·1	38·8	—	65·1	—	Complex lambdoid suture.
774	,,	111?	117	95·7	37·0	28·9	58·5	78·1	Aged; lambdoid suture partly obliterated. Wormi and L. JL.
779	,,	—	107	92·0	—	—	63·4	—	Sagittal suture closing.
783	,,	—	110	92·2	—	—	60·5	—	——
784	,,	—	115	93·2	—	—	57·8	—	Wormians in lambdoid suture R. and L.
790	,,	—	115	93·0	—	—	57·7	—	Ageing; sagittal suture closed, lambdoid nearly closed doid R. and L.
792	,,	—	113·5?	96·8?	32·2	26·2	62·3?	81·4	——
795	,,	—	111?	91·1?	31·4	25·8	58·8?	82·2	——
798	,,	—	—	—	31·6	28·4	—	89·9	——
799H	,,	—	110?	91·8	—	—	60·2?	—	——
859	,,	—	112·5	94·3	—	—	60·5	—	——
869	,,	—	116	94·1	36·9	29·9	57·9	81·0	Sagittal suture closed, lambdoid beginning to close. W R. and L. Tympanic perforation R. and L. J=.
886	,,	—	112	92·1	33·7	31·8	58·9	94·4	Single wormians in lambdoid suture R. and L. Bathr
888	,,	—	113	94·8	—	—	60·6	—	Aged; sagittal and lambdoid sutures partly obliterate
889	,,	—	—	—	36·6	29·8	—	81·4	Aged; lambdoid suture nearly obliterated.
893	,,	—	105	87·0	—	—	59·5	—	Wormians in lambdoid suture R. and L. Projecting o
894	,,	—	—	—	33·5	29·8	—	89·0	——

S_3'	*fml*	*fmb*	*Oc. I.*	$\frac{100\ fmb}{fml}$	
97·0	31·3	27·3	65·8	87·2	Single
94·0?	33·8	26·5	58·1?	78·4	Sagitt
90·0	35·1	28·0	61·9	79·8	Aged;
—	37·8	29·6	—	78·3	Lamb
92·7?	—	—	64·5?	—	—
100·1?	35·2?	—	57·3?	—	Aged;
95·1	—	—	61·9	—	Lamb
—	32·8	29·6	—	90·2	—
104·7	—	—	60·5	—	Sagitt Sm
90·1?	37·5	—	59·7?	—	Lamb
90·3	—	—	59·1	—	Aged; lan
94·4	—	—	61·1	—	Sagitt
—	30·5	26·6	—	87·2	—
—	36·2	27·9	—	77·1	—
98·7?	31·2	26·2	56·4?	84·0	Preco
95·7?	—	—	58·2?	—	Sagitt R.
100·1	33·7	28·0	58·1	83·1	Ageing R.
97·2	37·8	30·0	62·3	79·4	JL. S
89·5	34·6	29·7	58·8	85·8	Sagitt
99·1?	—	—	58·0?	—	Worm
89·6	—	—	55·8	—	Aged;
89·2?	—	—	61·0?	—	Aged; R.
94·0?	—	—	58·5?	—	Aged;
98·1	—	—	58·5	—	Ageing
88·0	31·7	27·8	60·5	87·7	Sagitt
93·0	—	—	61·4	—	Sagitt
89·2	—	—	66·0	—	Aged;
97·6	—	—	60·1	—	Sagitt
98·3	34·2	32·3	60·0	94·4	Sagitt
104·9?	—	—	59·0?	—	Lamb
98·1	35·7	32·7	60·5	91·6	Worm
92·9	—	—	63·4	—	Aged; lan
97·6	—	—	60·9	—	—
—	32·0	29·2	—	91·3	—
90·0	—	—	56·3	—	Aged; W
88·2?	—	—	60·8?	—	—
91·6	—	—	55·6	—	Sagitt jec
96·9	37·5	30·8	58·8	82·1	Lamb R.
93·1	—	—	58·4	—	Ageing R.
88·2?	35·0	29·8	59·1?	85·1	Worm
95·1?	—	—	54·9?	—	Lamb
95·2	—	—	58·1	—	Aged;
—	34·5	28·7	—	83·2	—
—	31·9	26·7	—	83·7	—
96·1?	31·9	25·3	58·2?	79·3	Lamb
92·8?	34·6	31·6	57·1?	91·3	—
92·1	—	—	56·6	—	Aged;
110·0	—	—	60·7	—	Worm
87·3	35·6	30·2	61·1	84·8	Aged;
93·1	38·8	—	65·1	—	Comp
95·7	37·0	28·9	58·5	78·1	Aged; an
92·0	—	—	63·4	—	Sagitt
92·2	—	—	60·5	—	—
93·2	—	—	57·8	—	Worm
93·0	—	—	57·7	—	Ageing do
96·8?	32·2	26·2	62·3?	81·4	—
91·1?	31·4	25·8	58·8?	82·2	—
—	31·6	28·4	—	89·9	—
91·8	—	—	60·2?	—	—
94·3	—	—	60·5	—	—
94·1	36·9	29·9	57·9	81·0	Sagitt R.
92·1	33·7	31·8	58·9	94·4	Single
94·8	—	—	60·6	—	Aged;
—	36·6	29·8	—	81·4	Aged;
87·0	—	—	59·5	—	Worm
—	33·5	29·8	—	89·0	—

100 *fmb* / *fml*	Remarks
87·2	Single wormians in lambdoid suture R. and L. JL.
78·4	Sagittal suture closed at obelion, lambdoid closing.
79·8	Aged; sagittal and lambdoid sutures nearly obliterated. JR.
78·3	Lambdoid suture closed. JL.
—	——
—	Aged; sagittal and lambdoid sutures nearly obliterated.
—	Lambdoid suture closing. Wormians R. and L.
90·2	——
—	Sagittal suture closed, lambdoid closing. Wormians in lambdoid R. and L. Small exostosis at obelion.
—	Lambdoid suture closing. Tympanic perforation R.
—	Aged; sagittal and lambdoid sutures almost obliterated. Wormians in lambdoid R. and L.
—	Sagittal suture closing, lambdoid beginning to close.
87·2	——
77·1	——
84·0	Precondyles.
—	Sagittal suture closing, lambdoid beginning to close. Wormians in lambdoid R. and L.
83·1	Ageing; sagittal suture closed, lambdoid closing. Wormians in lambdoid R. and L. JR.
79·4	JL. Small precondyles.
85·8	Sagittal suture closed, lambdoid closing.
—	Wormians in lambdoid suture R. and L.
—	Aged; sagittal and lambdoid sutures obliterated. JR.
—	Aged; sagittal suture obliterated, lambdoid closed. Wormians in lambdoid R. and L.
—	Aged; sagittal and coronal sutures obliterated.
—	Ageing; sagittal suture closed, lambdoid closing.
87·7	Sagittal suture closed, lambdoid closing. Precondyle R.
—	Sagittal suture closing. Wormians in lambdoid L.
—	Aged; sagittal and lambdoid sutures obliterated.
—	Sagittal and lambdoid sutures nearly closed.
94·4	Sagittal and lambdoid sutures closing. Epipteric bone L.
—	Lambdoid suture closed.
91·6	Wormians in lambdoid suture and at asteria and lambda.
—	Aged; sagittal and lambdoid sutures nearly obliterated. Wormians in lambdoid R.
—	——
91·3	——
—	Aged; sagittal and lambdoid sutures closed. Interparietal os triangulare R. Wormians in lambdoid L.
—	——
—	Sagittal suture closed, lambdoid closing. Wormians in lambdoid R. Projecting occiput. Wound on R. parietal.
82·1	Lambdoid suture closing, sagittal open. Numerous wormians in lambdoid R. and L. Asymmetrical.
—	Ageing; sagittal and lambdoid sutures closed. Wormians in lambdoid R. and L.
85·1	Wormians in lambdoid suture R. Precondyle R.
—	Lambdoid suture closing; numerous wormians R. and L.
—	Aged; sagittal and lambdoid sutures nearly obliterated.
83·2	——
83·7	——
79·3	Lambdoid suture closing; wormians R. and at asteria. JR.
91·3	——
—	Aged; sagittal and coronal sutures obliterated, lambdoid closing.
—	Wormians in lambdoid suture R. and L.
84·8	Aged; sagittal and lambdoid sutures closed. Ossicle of λ. JL.
—	Complex lambdoid suture.
78·1	Aged; lambdoid suture partly obliterated. Wormians in lambdoid R. and L. JL.
—	Sagittal suture closing.
—	——
—	Wormians in lambdoid suture R. and L.
—	Ageing; sagittal suture closed, lambdoid nearly closed. Wormians in lambdoid R. and L.
81·4	——
82·2	——
89·9	——
—	——
—	——
81·0	Sagittal suture closed, lambdoid beginning to close. Wormians in lambdoid R. and L. Tympanic perforation R. and L. J=.
94·4	Single wormians in lambdoid suture R. and L. Bathrocephalic. JR.
—	Aged; sagittal and lambdoid sutures partly obliterated.
81·4	Aged; lambdoid suture nearly obliterated.
—	Wormians in lambdoid suture R. and L. Projecting occiput.
89·0	——

APPENDIX II. *Individual Measurements of Spitalfields Skulls.*

No.	Sex	*IOW*	*B'*	*B''*	S_1	S_2	S_1'	S_2'	
72	♂?	—	—	—	—	123	—	109·7	Sagittal sutur
84	,,	—	93·2	—	—	—	—	—	Aged; sagittal
94	,,	102·5	98·1	124?	126	—	112·1	—	Coronal sutur
98	,,	—	—	—	—	113?	—	105·3	Wormians in l
99	,,	—	—	—	120	—	105·2	—	Ageing; sagitt
99E	,,	—	97·3	—	—	—	—	—	——
99F	,,	—	—	—	137·5	—	117·9	—	Ageing; coron
164	,,	97	105·0	125	135	—	114·1	—	Coronal sutur
169	,,	96	93·1	—	130	—	115·9	—	Aged; coronal
176	,,	100	100·3	—	—	—	106·0?	—	——
177	,,	—	—	—	122·5	117·5	109·1	104·2	Sagittal sutur
178	,,	98	98·0	130·5?	—	—	112·9	—	Coronal sutur
180	,,	—	99·9	128?	127	—	113·1	—	Sagittal and c
181	,,	—	—	—	130	—	116·1	—	Sagittal sutur
196	,,	—	—	—	118	—	106·0	—	Ageing; sagitt
198	,,	—	—	—	127·5	—	110·1	—	Ageing; sagitt
272	,,	—	—	—	130·5	—	114·1	—	Aged; all sutu
281	,,	—	—	—	—	132·5	—	120·2	Aged; sagittal
283	,,	101·5	98·0	137	134·5	—	117·0	—	——
288	,,	—	—	—	128	—	115·2	—	Ageing; sagitt
290	,,	—	—	—	123·5	—	108·2	—	Ageing; sagitt
386	,,	—	—	—	—	127·5	—	113·6	Aged; sagitta
399A	,,	—	—	—	122·5	—	107·0	—	Coronal sutur
399D	,,	100	95·1	—	123?	—	—	—	——
399E	,,	95	94·9	—	120?	—	—	—	Small exostos
444	,,	—	—	—	—	136	—	123·1	Sagittal sutur
450	,,	—	—	—	124·5	—	108·2	—	Ageing; sagitt
460	,,	—	88·8	—	125	—	108·7	—	Sagittal sutur
467	,,	—	—	—	—	115·5	—	—	Wormian in l
470	,,	—	97·1	—	129·5	—	113·0	—	Ageing; sagitt
488	,,	95	88·9	—	122·5	105	107·0	95·2	Sagittal and c
499C	,,	97	99·0	—	127	—	109·2	—	Sagittal sutur
554	,,	92·5?	101·9	126	123	—	109·2	—	Ageing; sagit LF + RP 8
577	♂?	—	—	—	—	125	—	111·6	Sagittal and c
591	,,	94·5	93·4	—	141	128·5	121·0	113·1	Ageing; all su
599	,,	—	—	—	—	126	—	113·0	Aged; all sutu
599D	,,	—	—	—	—	136·5	—	119·4	Ageing; sagitt
599E	,,	—	—	—	—	121	—	111·2	——
599N	,,	—	99·1	—	—	—	—	—	——
663	,,	—	—	—	—	120	—	106·9	Ageing; sagit *os épactal.*
699B	,,	97·5?	102·1	—	126	—	111·6	—	——
733	,,	—	—	—	—	130·5	—	112·6	Wormians in
772	,,	—	—	—	—	132·5?	—	119·2?	Ageing; sagit closed.
773	,,	—	—	—	—	121	—	108·6	Ageing; sagit lambdoid
776	,,	—	87·0	116·5	120·5	114	109·3	103·1	——
788	,,	—	103·2	—	—	—	—	—	Ageing; sagitt
791	,,	—	112·9	—	127·5	—	107·5	—	Ageing; coron
799A	,,	—	89·7	—	118?	—	—	—	——
799B	,,	—	—	—	117?	—	—	—	——
799C	,,	—	97·1	—	126?	—	—	—	——
799I	,,	—	—	—	120?	—	—	—	Metopic.
799J	,,	—	—	—	124?	—	—	—	——
836	,,	—	—	—	135·5	—	119·2	—	Aged; all sutu
849	,,	—	104·2	132	133	—	110·2	—	Sagittal sutu 4·5 mm.
863	,,	97·5	98·1	—	125	119·5	109·1	109·0	Ageing; sagitt Epipteric
870	,,	106	100·7	128·5	129	—	111·0	—	——
875	,,	—	—	—	—	126·5?	—	108·6?	Numerous wo ossicles in
881	,,	93	95·3	116	131	—	116·2	—	Sagittal sutur
882	,,	110	—	—	—	122	—	106·3	Aged; sagitta
885	,,	101	97·1	—	123	—	108·1	—	Aged; sagitta
890	,,	—	—	—	—	108	—	100·1	Ageing; sagit
892	,,	—	—	—	—	123?	—	100·1?	Ageing; sagit
898	,,	101·5	93·0	117?	128·5	—	114·9	—	Coronal sutur
899	,,	98	100·1	125?	129·5	—	115·0	—	Coronal sutur
899A	,,	—	97·1	122·5?	137	—	117·7	—	——

	Remarks
	Sagittal suture nearly obliterated.
	Aged; sagittal suture quite and coronal nearly ob
	Coronal suture closing.
	Wormians in lambdoid suture R. and L. and larg
	Ageing; sagittal and coronal sutures closing.
	—
	Ageing; coronal suture nearly obliterated.
	Coronal suture closing. Metopic; LF + RP 3 mm.
	Aged; coronal suture quite and sagittal partly ob
	—
	Sagittal suture closing.
	Coronal suture closing.
	Sagittal and coronal sutures closing. Small ossicl
	Sagittal suture closing, coronal beginning to close
	Ageing; sagittal suture partly obliterated, corona
	Ageing; sagittal suture nearly obliterated, corona
	Aged; all sutures nearly obliterated. Wound acro
	Aged; sagittal and lambdoid sutures nearly oblit
	—
	Ageing; sagittal suture closed, coronal closing.
	Ageing; sagittal suture closed, coronal closing.
	Aged; sagittal and lambdoid sutures obliterated,
	Coronal suture closed. Wormians in lambdoid L.
	—
	Small exostosis on frontal bone.
	Sagittal suture partly obliterated, lambdoid begi
	Ageing; sagittal suture partly obliterated, corona
	Sagittal suture closed, coronal closing.
	Wormian in lambdoid suture L., ossicle of λ.
	Ageing; sagittal and coronal sutures closed.
	Sagittal and coronal sutures closing.
	Sagittal suture closed, coronal closing.
	Ageing; sagittal suture closed, lambdoid and LF + RP 8 mm. Wormian in lambdoid L.
	Sagittal and coronal sutures closing.
	Ageing; all sutures nearly closed. Wormian in la
	Aged; all sutures partly obliterated.
	Ageing; sagittal suture closed, coronal closing.
	—
	—
	Ageing; sagittal suture closed, lambdoid and *os épactal*.
	—
	Wormians in lambdoid suture R. and L.
?	Ageing; sagittal suture obliterated, lambdoid closed.
	Ageing; sagittal and lambdoid sutures partly lambdoid R. and L.
	—
	Ageing; sagittal and coronal sutures closed.
	Ageing; coronal suture closed.
	—
	—
	—
	Metopic.
	—
	Aged; all sutures obliterated.
	Sagittal suture closing, lambdoid beginning to 4·5 mm.
	Ageing; sagittal suture obliterated, coronal closi Epipteric bone L.
	—
?	Numerous wormians in lambdoid suture R. and ossicles in sagittal suture.
	Sagittal suture closed, coronal closing.
	Aged; sagittal suture obliterated, coronal closed.
	Aged; sagittal suture obliterated, coronal closed.
	Ageing; sagittal suture closed, lambdoid closing.
?	Ageing; sagittal suture obliterated, lambdoid clo
	Coronal suture closed.
	Coronal suture closed.
	—

II. *Individual Measurements of Spitalfields Skulls.* VIII. *Male Calvarial Fragments (cont.).*

IOW	B′	B″	S_1	S_2	S_1'	S_2'	Remarks
—	—	—	—	123	—	109·7	Sagittal suture nearly obliterated.
—	93·2	—	—	—	—	—	Aged; sagittal suture quite and coronal nearly obliterated.
102·5	98·1	124?	126	—	112·1	—	Coronal suture closing.
—	—	—	—	113?	—	105·3	Wormians in lambdoid suture R. and L. and large ossicle of λ.
—	—	—	120	—	105·2	—	Ageing; sagittal and coronal sutures closing.
—	97·3	—	—	—	—	—	——
—	—	—	137·5	—	117·9	—	Ageing; coronal suture nearly obliterated.
97	105·0	125	135	—	114·1	—	Coronal suture closing. Metopic; LF + RP 3 mm.
96	93·1	—	130	—	115·9	—	Aged; coronal suture quite and sagittal partly obliterated.
100	100·3	—	—	—	106·0?	—	——
—	—	—	122·5	117·5	109·1	104·2	Sagittal suture closing.
98	98·0	130·5?	—	—	112·9	—	Coronal suture closing.
—	99·9	128?	127	—	113·1	—	Sagittal and coronal sutures closing. Small ossicle of bregma.
—	—	—	130	—	116·1	—	Sagittal suture closing, coronal beginning to close.
—	—	—	118	—	106·0	—	Ageing; sagittal suture partly obliterated, coronal closing.
—	—	—	127·5	—	110·1	—	Ageing; sagittal suture nearly obliterated, coronal closing.
—	—	—	130·5	—	114·1	—	Aged; all sutures nearly obliterated. Wound across coronal L.
—	—	—	—	132·5	—	120·2	Aged; sagittal and lambdoid sutures nearly obliterated, coronal closed.
101·5	98·0	137	134·5	—	117·0	—	——
—	—	—	128	—	115·2	—	Ageing; sagittal suture closed, coronal closing.
—	—	—	123·5	—	108·2	—	Ageing; sagittal suture closed, coronal closing.
—	—	—	—	127·5	—	113·6	Aged; sagittal and lambdoid sutures obliterated, coronal closed.
—	—	—	122·5	—	107·0	—	Coronal suture closed. Wormians in lambdoid L.
100	95·1	—	123?	—	—	—	——
95	94·9	—	120?	—	—	—	Small exostosis on frontal bone.
—	—	—	—	136	—	123·1	Sagittal suture partly obliterated, lambdoid beginning to close.
—	—	—	124·5	—	108·2	—	Ageing; sagittal suture partly obliterated, coronal nearly closed.
—	88·8	—	125	—	108·7	—	Sagittal suture closed, coronal closing.
—	—	—	—	115·5	—	—	Wormian in lambdoid suture L., ossicle of λ.
—	97·1	—	129·5	—	113·0	—	Ageing; sagittal and coronal sutures closed.
95	88·9	—	122·5	105	107·0	95·2	Sagittal and coronal sutures closing.
97	99·0	—	127	—	109·2	—	Sagittal suture closed, coronal closing.
92·5?	101·9	126	123	—	109·2	—	Ageing; sagittal suture closed, lambdoid and coronal closing. Metopic; LF + RP 8 mm. Wormian in lambdoid L.
—	—	—	—	125	—	111·6	Sagittal and coronal sutures closing.
94·5	93·4	—	141	128·5	121·0	113·1	Ageing; all sutures nearly closed. Wormian in lambdoid L.
—	—	—	—	126	—	113·0	Aged; all sutures partly obliterated.
—	—	—	—	136·5	—	119·4	Ageing; sagittal suture closed, coronal closing.
—	—	—	—	121	—	111·2	——
—	99·1	—	—	—	—	—	——
—	—	—	—	120	—	106·9	Ageing; sagittal suture closed, lambdoid and coronal closing. Bipartite *os épactal*.
97·5?	102·1	—	126	—	111·6	—	——
—	—	—	—	130·5	—	112·6	Wormians in lambdoid suture R. and L.
—	—	—	—	132·5?	—	119·2?	Ageing; sagittal suture obliterated, lambdoid nearly obliterated, coronal closed.
—	—	—	—	121	—	108·6	Ageing; sagittal and lambdoid sutures partly obliterated. Wormians in lambdoid R. and L.
—	87·0	116·5	120·5	114	109·3	103·1	——
—	103·2	—	—	—	—	—	Ageing; sagittal and coronal sutures closed.
—	112·9	—	127·5	—	107·5	—	Ageing; coronal suture closed.
—	89·7	—	118?	—	—	—	——
—	—	—	117?	—	—	—	——
—	97·1	—	126?	—	—	—	——
—	—	—	120?	—	—	—	Metopic.
—	—	—	124?	—	—	—	——
—	—	—	135·5	—	119·2	—	Aged; all sutures obliterated.
—	104·2	132	133	—	110·2	—	Sagittal suture closing, lambdoid beginning to close. Metopic; LF + RP 4·5 mm.
97·5	98·1	—	125	119·5	109·1	109·0	Ageing; sagittal suture obliterated, coronal closing. Metopic; LF + RP 7 mm. Epipteric bone L.
106	100·7	128·5	129	—	111·0	—	——
—	—	—	—	126·5?	—	108·6?	Numerous wormians in lambdoid suture R. and L. Ossicle of λ and 2 small ossicles in sagittal suture.
93	95·3	116	131	—	116·2	—	Sagittal suture closed, coronal closing.
110	—	—	—	122	—	106·3	Aged; sagittal suture obliterated, coronal closed. Depression at obelion.
101	97·1	—	123	—	108·1	—	Aged; sagittal suture obliterated, coronal closed.
—	—	—	—	108	—	100·1	Ageing; sagittal suture closed, lambdoid closing.
—	—	—	—	123?	—	100·1?	Ageing; sagittal suture obliterated, lambdoid closed.
101·5	93·0	117?	128·5	—	114·9	—	Coronal suture closed.
98	100·1	125?	129·5	—	115·0	—	Coronal suture closed.
—	97·1	122·5?	137	—	117·7	—	——

No.	Sex	C	IOW	B′	B″	B	Biasterionic B	F	F.V.L	L	H′	H	OH	Bregmatic OH	LB	S_1'	S_2'	S_3'	S_1	S_2
4	♀?	—	95	100·2	—	143	111·5?	181·5	—	181·5	131	—	—	—	95·0	114·3	112·3	99·2	131?	125?
6	♂♀	1206	96	98·2	117?	137	106	172·5	—	173·5	119	—	—	—	—	—	102·9	89·0	—	111
22	♂♀	—	91·5?	88·9	117?	142	108·5?	172·5	—	171·5	132·5?	—	—	—	—	—	112·3?	99·8	—	—
24	♂?	—	—	—	—	—	95?	171	170	171·5	127·5	127	115	116·5	91·5	113·4	113·3	83·0	128·5	123
25	♂	1123	93·5	94·1	118	136	100·5	159	159·5	160	130·5	131	111	110·5	92·3	109·5	102·1	87·3	122	115
30	♂	—	93?	95·2	119	132	102·5	173·5	—	174·5	126·5	—	—	—	—	—	108·2	90·0	—	118
44	♂	—	—	—	—	135·5	104·5?	173·5	—	173·5	129	—	—	—	—	—	108·0	95·9	—	122·5
48	♂?	—	—	—	—	—	107	—	—	—	133·5	—	—	—	—	—	—	95·2	—	134
55	♀	—	96	95·2	—	—	—	—	171	171	123	126	115	114?	—	—	—	—	—	—
62	♂	—	—	—	—	—	—	—	—	—	131	—	—	—	—	—	109·2?	99·6?	—	—
101	♂	—	—	96·2	116?	133·5	111	172	—	172	124·5	—	—	—	93·0?	101·3?	107·1	95·8	111?	116
105	♀	—	—	87·9	109	130	103	173	—	174	124·5	—	—	—	94·3	108·1	105·6	97·2	121	115·5
114	♂	—	—	—	—	135·5	106·5	—	—	170	122·5	—	—	—	94·0	99·2	99·9	97·8	116·5	111
121	♂?	—	89·5	89·8	110·5	127	102·5	172	173·5	173·5	119·5	120	106	104	94·8	101·3	113·3	88·0	110·5	129
134	♂	—	94·5	89·0	—	—	102	167·5	167·5	168	120	120	106·5	106	91·9	105·8	98·0	95·9	120	110
142	♂	—	95	94·6	—	—	—	179·5	—	179·5	—	—	—	—	99·9	—	—	90·0	—	—
161	♂♀	—	—	93·2	—	—	—	—	—	—	124·5	—	—	—	92·6	105·8	106·3	89·1	120	117
205	♀	1105	90·5	93·8	—	130·5	—	163·5	165	165	—	116	103·5	—	95·9	—	—	97·7	—	—
206	♂	1073	97·5	92·8	—	131	104	158	158	159	112	112·5	101·5	100·5	89·8	96·8	96·2	87·2	111·5	107
207	♂♀	1162	92·5	92·6	111	129	108	165	169	169	125·5	125·5	106	105	97·8	99·9	102·3	97·5	112·5	111·5
212	♂♀	1324	94?	100·0	120·5	138	93	178·5	176	177	129	130	111	110·5	97·9	106·0	110·6	91·7	126	122
213	♂?	1346	—	94·5	—	140·5	—	171·5	—	172	—	—	—	—	95·4	—	—	—	—	—
217	♂♀	—	—	92·9	120·5?	138	96	181	—	181	130	—	—	—	100·0	112·3	110·4	96·7	132	126·5
250	♂?	—	—	98·4	114·5	—	—	167	—	168	—	—	—	—	—	101·6	—	—	113	—
254	♂	—	98·5	94·2	—	—	—	179?	—	179?	—	—	—	—	—	101·7?	—	—	116?	—
305	♂	1201	94	95·2	121·5	129·5	98·5	170	168·5	172·5	125	124·5	106·5	106·5	94·8	107·4	102·4?	88·9?	130	111?
307	♂	—	98	94·8	115·5?	139	—	173·5	—	175	130·5	—	—	—	96·5	108·2	110·0	93·7	126	121
309	♂?	—	96	91·2	—	140·5	—	167	—	167	128?	—	—	—	93·4	109·0	103·5	96·9	123	117
317	♂♀	—	95	91·0	114	140·5	—	165	—	167	122	—	—	—	95·0	104·6	100·0	88·0	116·5	108·5
325	♂?	—	—	97·1	118·5?	136	107	169·5	171	171	126	127·5	113	111	90·3	108·0	111·6?	91·2?	123	126·5?
329	♀	—	93·5	98·6	124	144	113	178	—	179	137	—	—	—	99·1	116·0	113·8	95·3	133·5	126·5
331	♀	—	90	90·9	116?	137·5	112?	163	—	163·5	125·5	—	—	—	94·3	102·0?	109·1	86·8	114·5?	124?
339	♀	—	94	94·6	117?	133	101·5?	166·5	—	166·5	128·5?	—	—	—	92·9	105·7	102·2	97·1	121	112·5?
408	♂♀	1315	—	101·6	119?	140	110	174	—	174	128·5	—	—	—	98·2	102·4	114·2	93·9	116·5	127
416	♂?	—	93·5?	91·5	—	140	111	174·5	—	174·5	123·5	—	—	—	97·3	108·8	108·3?	89·4?	123	120·5?
421	♂	—	88·5	91·2	—	131	104·5?	175·5	—	176·5	—	—	—	—	107·1?	93·0?	—	—	122·5?	99?
432	♂?	—	94	97·2	113?	132?	103	179	179	179	127	127·5	110	108·5	98·6	104·8	113·8	98·7	119	129·5
434	♀	—	87	89·7	—	132·5	100	169	—	169	124	—	—	—	93·9	106·8	105·6	88·2	128	119
439	♀	—	—	—	—	148	110?	167	—	167	125	—	—	—	99·6	103·2	101·0	96·8	116·5	111·5
447	♀	—	92·5	88·6	117?	—	—	—	—	—	124	124·5	109	108·5	89·0	109·6?	—	—	125?	—
497	♀	—	—	—	—	140	—	—	—	—	124	—	—	—	94·6	111·4	—	—	124	—
502	♀	1295	92	88·5	121	144·5	106·5	164·5	165·5	165·5	122	125	114·5	111·5	94·3	105·8	92·2?	108·8?	118	101?
509	♂♀	1405	96	95·2	—	146	—	176	176	176	134	133	116	116·5	100·6	113·7	113·1?	89·0?	131·5	125?
510	♂♀	1320	94·5	95·2	124·5	138	100	171	—	170·5	128	—	—	—	92·8	112·0	100·3?	94·1?	131	112·5?
512	♂?	1222	89·5	93·3	118?	138	—	172·5	173	173	120·5	119·5	104·5	105	96·2	98·9	110·0	92·5?	111	120?
520	♀	—	97	92·1	120·5	141	109·5	174	—	174	125	—	—	—	90·8	109·3	113·7	91·5	126	128
521	♀	—	91·5	96·5	116·5	133·5	105·5	171·5	172·5	172·5	—	—	113·5	112·5	—	109·1	108·0	98·0	124·5	122
523	♀	1277	98·5	100·2	116·5	138·5	109·5	175·5	175·5	176	124	123·5	110	107·5	97·3	105·0	107·1	92·6	120	119
534	♂	—	96·5	100·1	122?	134·5	101·5	181	—	182	135·5	—	—	—	101·6	108·0	118·6	96·1	125	132
600	♂	—	85·5	85·2	108·5?	127	102·5	155·5	156	156	120	121	106	104·5	87·4	99·0	90·5	95·6	113	98
639	♀	—	101	96·5	114	131·5	—	172·5	—	174	—	—	—	—	—	108·0	105·8?	88·1?	122·5	116?
678	♂	—	94	90·2	117·5?	—	—	173	—	174	—	—	—	—	—	106·1	—	—	122·5	—
698	♂?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
713	♂	—	95	96·5	120·5?	144	—	175·5	—	176	128	—	—	—	97·6	105·6?	104·5?	97·0?	121?	116·5?
714	♂	1312	86	84·9	112·5	134	99·5?	168·5	168	168	132·5	134·5	116	113	92·3	104·8	112·1	97·7	119·5	127
719	♂?	—	93·5	96·2	115	—	—	177·5	—	177·5	—	—	—	—	—	103·0	—	—	114	—
720	♂	—	—	—	—	131	—	163	—	163	126·5	—	—	—	88·7	102·3	99·3	95·0	116	109
721	♂♀	—	90·5	92·3	111·5?	123	—	163	163	163	—	—	—	—	91·3	—	—	86·4	—	—
724	♂?	—	—	—	—	142?	—	—	—	—	—	—	—	—	100·0	—	—	96·0?	—	—
726	♂♀	—	—	—	—	—	—	168·5	—	168·5	123·5	—	—	—	93·0	108·1	103·9	89·6	122	116
732	♂	—	89·5	93·0	—	—	—	174·5	—	174·5	118·5	—	—	—	95·4	104·0	108·8?	89·9?	121·5	122·5?
735	♂?	—	94·5	98·0	—	—	—	171·5	—	171·5	129·5	—	—	—	98·1	108·7	108·0	93·9	122·5	121
738	♀	—	—	—	—	—	—	178	—	178·5	—	—	—	—	—	107·1	—	—	122	—
810	♂	—	102	104·0	125·5	143·5	102	179	177	178	126·5	127·5	109·5	110·5	95·0	106·7	108·8?	95·3	126	120·5?
811	♂♀	—	88	88·0	—	129·5	88	165	165	165·5	126·5	125	103·5	104·5	94·7	103·3	97·6?	92·8?	117·5	106?
820	♂?	—	—	—	—	143·5	—	166	—	166	127	—	—	—	98·0	100·8	108·4	88·7	114	121·5
848	♂	—	—	—	—	135	110	—	—	—	128	—	—	—	—	—	106·9?	97·8	—	118?
856	♀	—	—	—	—	128·5	102	—	—	—	120	119·5	99·5	99	—	—	103·1	81·2	—	116
861	♂	—	92	87·4	—	—	—	—	—	158	—	—	—	—	—	—	—	—	—	—

S_2'	S_3'	S_1	S_2	S_3	S	U	*Broca's Q'*	Q'	*Bregmatic Q'*	$G'H$	GL	GB	J	NH, R	NH, L	NH'	
112·3	99·2	131?	125?	114·5?	369·5?	—	305?	—	310?	—	—	—	—	—	—	—	
102·9	89·0	—	111	107	—	499	292	—	301	—	—	—	—	—	—	—	
112·3?	99·8	—	—	119	—	501	302?	—	311?	—	—	—	—	—	—	—	
113·3	83·0	128·5	123	100·5	352·5	—	—	—	—	72·2	83·5	86·1	130?	53·7	53·2	51·9	
102·1	87·3	122	115	99·5	337·5	468	288	300	293	66·4	87·4	90·6	124	48·8	47·9	47·8	
108·2	90·0	—	118	106·5	—	491	299	—	310	—	—	—	—	—	—	—	
108·0	95·9	—	122·5	112	—	—	—	—	—	—	—	—	—	—	—	—	
—	95·2	—	134	113	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	64·0	94·3	90·7	123	47·7	46·6	44·1	
109·2?	99·6?	—	—	115·5?	—	—	—	—	—	—	—	—	—	—	—	—	
107·1	95·8	111?	116	119	346·5?	495	276	—	282	—	—	—	—	—	—	—	
105·6	97·2	121	115·5	112·5	349·5	488	281·5	—	288	—	—	—	—	—	—	—	
99·9	97·8	116·5	111	118	345·5	—	—	—	—	—	—	—	—	—	—	—	
113·3	88·0	110·5	129	108	348	480	274?	—	280?	—	—	—	116	—	—	—	
98·0	95·9	120	110	111·5	340·5	—	—	—	—	66·4	90·2	98·0	—	48·1	48·1	46·2	
—	90·0	—	—	112	370?	—	—	—	—	—	—	90·6	—	—	—	—	
106·3	89·1	120	117	108	344	—	—	—	—	—	—	—	—	—	—	—	
—	97·7	—	—	119·5	331	477	—	294	—	67·2	91·1	84·3	117	45·8	46·7	45·3?	
96·2	87·2	111·5	107	101·5	321	470	273	279	277	65·1	84·4	83·8	118·5	48·1	47·4	46·1	
102·3	97·5	112·5	111·5	112·5	337	481	275	285	283	60·5?	96·9?	92·4	122·5	46·0	45·8	43·8?	
110·6	91·7	126	122	108·5	356	511	292	300	297	65·3?	85·2?	—	—	49·7	48·9	46·2	
—	—	—	—	—	—	508	—	—	—	—	—	—	—	—	—	—	
110·4	96·7	132	126·5	115	374	—	303	—	310	—	—	—	—	—	—	—	
—	—	113	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
—	—	116?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
102·4?	88·9?	130	111?	105?	345·5	489	289	296	297	—	—	—	—	—	—	—	
110·0	93·7	126	121	110·5	358	—	—	—	—	—	—	—	—	—	—	—	
103·5	96·9	123	117	114	353	494	304?	—	312?	—	—	—	—	—	—	—	
100·0	88·0	116·5	108·5	105	329	482	291?	—	297?	—	—	—	—	—	—	—	
111·6?	91·2?	123	126·5?	106?	355	495	293	305	300	58·0?	88·3?	88·6	—	40·6	40·1	38·8	
113·8	95·3	133·5	126·5	111	371	511	—	—	—	—	—	—	—	—	—	—	
109·1	86·8	114·5?	124?	105	342·5	—	—	—	—	—	—	91·2	—	48·9	48·5	48·8	
102·2	97·1	121	112·5?	114	348	—	—	—	—	66·1	90·8	82·3	—	48·0	48·0?	47·9?	
114·2	93·9	116·5	127	109·5	353	507	299	—	305	—	—	—	—	—	—	—	
108·3?	89·4?	123	120·5?	107·5?	351	505?	297	—	303	—	—	—	—	—	—	—	
—	—	122·5?	99?	—	—	—	288	—	294	66·5?	—	—	—	48·6	49·0	—	
113·8	98·7	119	129·5	119·5	369	—	—	—	—	64·0	91·7	—	120·5	46·6	46·6	45·8	
105·6	88·2	128	119	107·5	355	—	292	—	299	—	—	—	—	—	—	—	
101·0	96·8	116·5	111·5	111	340	—	—	—	—	—	—	—	—	—	—	—	
—	—	125?	—	—	—	—	291	302?	300	—	—	82·2	—	47·3	46·4	45·4	
—	—	124	—	—	—	—	—	—	—	64·3?	89·6?	—	—	44·1	44·3	44·6	
92·2?	108·8?	118	101?	125·5?	345	496	303	314·5	311	61·0	92·9	93·4	127·5	45·0	44·9	42·7	
113·1?	89·0?	131·5	125?	103·5?	360	513	314	327	325	70·3	89·8	98·0	127	49·7	48·6	47·6	
100·3?	94·1?	131	112·5?	110?	355	496	313	—	319	—	—	—	—	—	—	—	
110·0	92·5?	111	120?	111?	343	501	282	292	291	66·3?	90·0	—	—	48·4	47·1?	45·8	
113·7	91·5	126	128	107·5	362	502	298	—	303	—	—	—	—	—	—	—	
108·0	98·0	124·5	122	111·5	358	501	301	311	309	68·0	—	91·9	120·5	46·7	—	47·2	
107·1	92·6	120	119	114	353	511	290	297	296	—	—	—	—	—	47·9	47·9	
118·6	96·1	125	132	114	372	—	—	—	—	—	—	—	—	—	—	—	
90·5	95·6	113	98	110	320	456	282	292	287	53·7	84·3	75·5	—	40·1	40·6	37·7	
105·8?	88·1?	122·5	116?	105?	344	—	—	—	—	—	—	—	—	50·9	—	—	
—	—	122·5	—	—	—	—	—	—	—	65·6	—	89·0	—	49·3	49·2	43·3	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
104·5?	97·0?	121?	116·5?	116?	355	—	—	—	—	—	—	—	—	—	—	—	
112·1	97·7	119·5	127	113	360	480	297	305	304	65·9?	91·7?	83·7	—	46·8	47·0	45·9	
—	—	114	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
99·3	95·0	116	109	111·5	337	—	—	—	—	—	—	—	—	—	—	—	
—	86·4	—	—	100	—	469	—	—	—	64·0	92·1	84·0	—	45·3	44·0	41·0	
—	96·0?	—	—	115?	—	—	—	—	—	66·4	94·1	91·2	131	49·6	49·4	47·5	
103·9	89·6	122	116	108	347	—	—	—	—	—	—	—	—	—	—	—	
108·8?	89·9?	121·5	122·5?	113·5?	358	—	—	—	—	—	—	—	—	—	49·7	49·1?	
108·0	93·9	122·5	121	107	351	—	—	—	—	—	—	—	—	—	—	—	
—	—	122	—	—	—	—	—	—	—	—	—	—	—	53·7	—	—	
108·8?	95·3	126	120·5?	114·5	365?	520	301	312	308	64·0?	89·0?	94·2	125?	49·3	48·9	45·9	
97·6?	92·8?	117·5	106?	112?	337	475	—	—	—	58·3?	83·9?	80·5	118·5	44·0	44·9	43·2	
108·4	88·7	114	121·5	103	339	—	—	—	—	—	—	—	—	—	—	—	
106·9?	97·8	—	118?	115	—	—	—	—	—	—	—	—	—	—	—	—	
103·1	81·2	—	116	93·5	—	—	270	283	278	—	80·8	—	—	—	—	—	
—	—	—	—	—	—	—	—	—	—	61·8	—	—	—	45·9	45·9	43·0	

NH, L	*NH'*	*NB*	*DS*	*DC*	*DA*	*SS*	*SC*	O_1R	O_1L	$O_1'R$	$O_1'L$	*Lacr.* O_1R	*Lacr.* O_1L	O_2R	O_2L	G_1'	G_1	G_2	*EH*	*fml*	*fmb*	100 *B* / *L*	100 *B* / *F.V.L*
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	36·0	34·3	78·8	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	39·8	25·4	79·0	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32·9	26·1	82·8	—
53·2	51·9	24·2	—	—	—	4·5	7·4	41·5	41·3	—	—	—	—	33·9	35·1	42·4?	44·9	—	—	32·6	26·2	—	—
47·9	47·8	23·9	—	—	—	4·9	11·1	38·7	39·6	—	—	—	—	32·9	33·6	—	—	42·1	11·5	32·9	26·9	85·0	85·3
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35·9	27·9	75·6	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35·0	29·0	78·1	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34·0	30·7	—	—
46·6	44·1	24·0	11·8	23·7	36·3	2·8	6·4	40·7	39·8	38·8	37·2	38·1	36·6	29·2	29·0	43·8	48·9	40·3	10·2	32·5	25·2	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28·2?	—	—	—	—	34·0	30·2	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35·0	28·8	77·6	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37·1	27·6	74·7	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33·3	27·7	79·7	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	28·9?	29·0?	—	—	—	—	34·3	25·4	73·2	73·2
48·1	46·2	21·7	9·6	18·9	32·9	3·3	8·9	39·9	38·5	39·5	37·8	37·8	36·6	33·2	32·6	43·0	45·6?	—	—	36·8	30·1	—	—
—	—	—	—	—	—	4·5	7·9	41·2	41·8	37·8	—	37·2	—	33·7	35·1	—	—	—	—	31·9	26·8	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33·3	25·1	—	—
46·7	45·3?	20·9	11·9	19·1	34·7	4·2	7·8	38·9	38·4	38·1	36·9	36·0	35·4	29·8	30·6	44·6	48·7	39·7	18·1	30·4	28·5	79·1	79·1
47·4	46·1	24·0	9·9	18·5	33·6	4·8	9·2	42·8	42·2	41·2	41·0	38·0	38·8	33·8	33·6	41·5	44·6	—	—	32·8	30·9	82·4	82·9
45·8	43·8?	23·1	—	—	—	2·3	6·1	39·1	39·5	—	38·1	—	—	30·7	31·5	45·5	50·0	—	—	32·2	28·5	76·3	76·3
48·9	46·2	24·7	—	—	—	2·5	9·5	40·1	—	—	—	—	—	32·8	—	—	—	—	—	37·4	30·5	78·0	78·4
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34·0	27·4	81·7	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29·8	21·9	76·2	—
—	—	—	—	—	—	4·3	10·0	—	42·0	—	—	—	—	—	34·7	—	—	—	—	—	—	—	—
—	—	—	—	—	—	3·0	9·2	41·9?	—	—	—	—	—	33·1	33·9?	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	38·9	—	—	—	—	—	30·2	—	—	—	—	—	35·8	30·5	75·1	76·9
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37·8	29·3	79·4	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33·3	—	84·1	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32·5	—	—	—	—	36·7	29·8	84·1	—
40·1	38·8	21·9	—	—	—	5·7	11·1	39·8	38·6	37·8	—	36·2?	—	29·0	29·7	—	—	41·2	8·2?	36·4	29·1	79·5	79·5
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34·9	30·8	80·4	—
48·5	48·8	26·3	—	—	—	4·1	9·0	36·7	37·6	—	—	—	—	32·7	32·3	44·3	48·2	40·8	11·5?	36·1	26·3	84·1	—
48·0?	47·9?	23·5	—	—	—	5·1	10·3	38·4	39·0	37·9	—	35·7	—	30·2	30·4	43·1	45·2	—	—	33·8	27·5	79·9	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35·5	30·2	80·5	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33·2	28·5	80·2	—
49·0	—	21·4	—	—	—	4·8	6·1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	74·2	—
46·6	45·8	21·3	9·9	18·2	30·5	3·6	9·4	42·1	42·6	40·9	39·5	39·0	38·1	32·8	33·1	41·9	45·5?	37·9?	8·1?	35·9	30·0	73·7?	73·7?
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32·2?	26·3	78·4	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35·3	—	88·6	—
46·4	45·4	22·0	10·2	17·5	32·9	4·9	7·1	40·8	41·1	39·4	38·7	—	—	32·5	32·8	38·2	41·3	—	—	37·2	27·6	—	—
44·3	44·6	20·2	—	—	—	—	—	41·6	—	—	—	—	—	29·7	—	—	—	—	—	30·7	25·9	—	—
44·9	42·7	27·3	11·2	21·9	35·4	4·7	12·0	40·8	39·6	39·2	38·3	—	36·8	32·2	31·8	41·4	45·7	43·7	8·3	38·0	31·4	87·3	87·3
48·6	47·6	25·6	13·6	22·5	41·5	4·9	13·1	42·3	42·1	40·6	41·1	40·1	40·4	33·7	33·1	42·5	46·5	—	—	35·4	26·9	83·0	83·0
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35·1	28·4	80·9	—
47·1?	45·8	23·1	—	—	—	4·4	11·0	39·9	39·1	—	—	—	—	30·8	31·1	—	—	—	—	33·7	33·0	79·8	79·8
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	36·1	—	81·0	—
—	47·2	20·0	—	—	—	5·0	9·7	39·1	39·5	—	—	—	—	32·6	32·5?	—	—	—	—	—	—	77·4	77·4
47·9	47·9	—	—	—	—	—	—	—	40·7	—	38·8	—	37·8	—	34·0?	—	—	—	—	32·7	26·8	78·7	78·9
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	37·4?	—	73·9	—
40·6	37·7	22·6	—	—	—	3·0	9·2	37·2	38·0	—	—	—	—	28·1	30·3	40·8	44·9	—	—	34·9	30·0	81·4	81·4
—	—	—	—	—	—	5·5	11·9	42·8	—	—	—	—	—	34·9	—	—	—	—	—	—	—	75·6	—
49·2	43·3	27·3	11·6	26·3	39·8	3·9	15·0	37·8	39·3	35·1	36·9	34·0	35·3	29·0	29·5	42·2	—	38·5?	10·6?	—	—	—	—
—	—	—	—	—	—	—	—	—	39·4	—	—	—	—	—	32·5	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	36·8	—	81·8	—
47·0	45·9	24·9	—	—	—	4·0	7·4	40·1?	37·8	—	—	—	—	30·9?	31·0	43·5	48·2?	—	—	35·3	30·8	79·8	79·8
—	—	—	—	—	—	5·2?	10·7?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	3·7?	6·8?	36·1?	—	—	—	—	—	—	—	—	—	—	—	37·2	30·4	80·4	—
44·0	41·0	23·1	10·5	21·8	33·6	3·8	8·8	39·5	40·2	37·2	37·7	36·3	—	31·1	32·0	41·3	44·9	—	—	33·1	24·8	75·5	75·5
49·4	47·5	26·4	—	—	—	—	—	42·3	42·0	—	—	—	—	35·4	—	—	50·0	—	—	35·2	28·7	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	33·0	26·4	—	—
49·7	49·1?	23·4	—	—	—	4·4	10·7	—	37·8	—	36·3	—	34·3	—	32·5	—	—	—	—	29·6	25·7	—	—
—	—	—	—	—	—	—	—	42·8	—	—	—	—	—	33·1	—	—	—	—	—	36·9	30·0	—	—
48·9	45·9	26·7	—	—	—	2·7	10·9	42·0	42·0	—	—	—	—	33·9	33·5	39·2	43·6	43·4	8·7	38·3	29·3	80·6	81·1
44·9	43·2	21·5	—	—	—	—	—	38·5	38·1	—	36·8	—	35·3	28·8	29·7	—	—	—	—	32·5	26·1	78·2	78·5
—	—	—	—	—	—	—	—	—	40·1	—	—	—	—	—	29·9?	—	—	—	—	35·0	27·6	86·4	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	34·7	32·7	—	—
—	—	—	—	—	—	—	—	40·8?	—	—	—	—	—	34·7	—	—	—	—	—	27·8	25·3?	—	—
45·9	43·0	24·1	—	22·2	—	4·3	10·0	—	37·8	—	35·5	—	34·1	—	32·4	—	—	—	—	—	—	—	—

l Measurements of Spitalfields Skulls. IX. *Female Skulls.*

100 $\frac{B}{L}$	100 $\frac{B}{F.V.L}$	100 $\frac{H'}{L}$	100 $\frac{H}{L}$	100 $\frac{H}{F.V.L}$	100 $\frac{B}{H'}$	100 $\frac{B}{H}$	100 $\frac{(B-H')}{L}$	*Oc. I.*	100 $\frac{fmb}{fml}$	100 $\frac{G'H}{GB}$	100 $\frac{NB}{NH'}$	100 $\frac{NB}{NH}$, *R*	100 $\frac{NB}{NH}$, *L*	100 $\frac{DS}{DC}$	100 $\frac{SS}{SC}$	100 $\frac{O_2}{O_1}$, *R*	100 $\frac{O_2}{O_1}$, *L*	100 $\frac{O_2}{O_1}$
78·8	—	72·2	—	—	109·2	—	6·6	64·5?	95·3	—	—	—	—	—	—	—	—	—
79·0	—	68·6	—	—	115·1	—	10·4	59·9	63·8	—	—	—	—	—	—	—	—	—
82·8	—	77·3?	—	—	107·2?	—	5·5?	60·6	79·3	—	—	—	—	—	—	—	—	—
—	—	74·4	74·1	74·7	—	—	—	59·2	80·4	83·9	46·6	45·1	45·5	—	60·8	81·7	85·0	—
85·0	85·3	81·6	81·9	82·1	104·2	103·8	3·4	66·4	81·8	73·3	50·0	49·0	49·9	—	44·1	85·0	84·8	—
75·6	—	72·5	—	—	104·3	—	3·1	61·4	77·7	—	—	—	—	—	—	—	—	—
78·1	—	74·4	—	—	105·0	—	3·7	62·9	82·9	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	61·1	90·3	—	—	—	—	—	—	—	—	—
—	—	71·9	73·7	73·7	—	—	—	—	77·5	70·6	54·4	50·3	51·5	49·8	43·8	71·7	72·9	75·
—	—	—	—	—	—	—	—	63·6?	88·9	—	—	—	—	—	—	—	—	—
77·6	—	72·4	—	—	107·2	—	5·2	57·4	82·3	—	—	—	—	—	—	—	—	—
74·7	—	71·6	—	—	104·4	—	3·2	64·1	74·4	—	—	—	—	—	—	—	—	—
79·7	—	72·1	—	—	110·6	—	7·6	59·5	83·2	—	—	—	—	—	—	—	—	—
73·2	73·2	68·9	69·2	69·2	106·3	105·8	4·3	58·2	74·1	—	—	—	—	—	—	—	—	—
—	—	71·4	71·4	71·6	—	—	—	63·4	81·8	67·8	47·0	45·1	45·1	50·8	37·1	83·2	84·7	84·
—	—	—	—	—	—	—	—	57·3	84·0	—	—	—	—	—	57·0	81·8	84·0	89·
—	—	—	—	—	—	—	—	59·1	75·4	—	—	—	—	—	—	—	—	—
79·1	79·1	—	70·3	70·3	—	112·5	—	58·5	93·8	79·7	46·1?	45·6	44·8	62·3	53·8	76·6	79·7	78·
82·4	82·9	70·4	70·8	71·2	117·0	116·4	12·0	63·3	94·2	77·7	52·1	49·9	50·6	53·5	52·2	79·0	79·6	82·
76·3	76·3	74·3	74·3	74·3	102·8	102·8	2·1	64·5	88·5	65·5?	53·0	50·2	50·4	—	37·7	78·5	79·7	—
78·0	78·4	72·9	73·4	73·9	107·0	106·2	5·1	61·4	81·6	—	53·5	49·7	50·5	—	26·3	81·8	—	—
81·7	—	—	—	—	—	—	—	—	80·6	—	—	—	—	—	—	—	—	—
76·2	—	71·8	—	—	106·2	—	4·4	60·9	73·5	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	43·0	—	82·6	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	32·6	79·0?	—	—
75·1	76·9	72·5	72·2	73·9	103·6	104·0	2·6	61·6?	85·2	—	—	—	—	—	—	77·6	—	—
79·4	—	74·6	—	—	106·5	—	4·9	61·8	77·5	—	—	—	—	—	—	—	—	—
84·1	—	76·6?	—	—	109·8?	—	7·5?	62·1	—	—	—	—	—	—	—	—	—	—
84·1	—	73·1	—	—	115·2	—	11·1	60·5	81·2	—	—	—	—	—	—	—	—	—
79·5	79·5	73·7	74·6	74·6	107·9	106·7	5·8	63·5?	79·9	65·5?	56·2	53·9	54·6	—	51·3	72·9	76·9	76·7
80·4	—	76·5	—	—	105·1	—	3·9	63·2	88·3	—	—	—	—	—	—	—	—	—
84·1	—	76·8	—	—	109·6	—	7·3	59·3	72·9	—	54·9	54·2	53·9	—	45·6	89·1	85·9	—
79·9	—	77·2?	—	—	103·5?	—	2·7?	62·3	81·4	80·3	49·9?	49·0	49·1?	—	49·5	78·6	77·9	79·7
80·5	—	73·9	—	—	108·9	—	6·6	63·1	85·1	—	—	—	—	—	—	—	—	—
80·2	—	70·8	—	—	113·4	—	9·6	59·9?	85·8	—	—	—	—	—	—	—	—	—
74·2	—	—	—	—	—	—	—	—	—	—	—	44·0	43·7	—	78·7	—	—	—
73·7?	73·7?	70·9	71·2	71·2	103·9?	103·5?	2·8?	59·2	83·6	—	46·5	45·7	45·7	54·4	38·3	77·9	77·7	80·2
78·4	—	73·4	—	—	106·9	—	5·0	58·7	81·7?	—	—	—	—	—	—	—	—	—
88·6	—	74·9	—	—	118·4	—	13·8	65·4	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	74·2	—	48·5	46·5	47·4	58·3	69·0	79·7	79·8	82·5
—	—	—	—	—	112·9	—	—	—	84·4	—	45·3	45·8	45·6	—	—	71·4	—	—
87·3	87·3	73·7	75·5	75·5	118·4	115·6	13·6	64·6?	82·6	65·3	63·9	60·6	60·8	51·1	39·2	78·9	80·3	82·1
83·0	83·0	76·2	75·6	75·6	109·0	109·8	6·8	63·4?	76·0	71·7	53·8	51·5	52·7	60·4	37·4	79·7	78·6	83·0
80·9	—	75·1	—	—	107·8	—	5·9	62·8?	80·9	—	—	—	—	—	—	—	—	—
79·8	79·8	69·7	69·1	69·1	114·5	115·5	10·1	60·0?	97·9	—	50·5	47·7	49·0?	—	40·0	77·2	79·5	—
81·0	—	71·8	—	—	112·8	—	9·2	62·1	—	—	—	—	—	—	—	—	—	—
77·4	77·4	—	—	—	—	—	—	66·7	—	74·0	42·4	42·8	—	—	51·5	83·4	82·3?	—
78·7	78·9	70·5	70·2	70·4	111·7	112·1	8·2	60·4	82·0	—	—	—	—	—	—	—	83·5?	—
73·9	—	74·5	—	—	99·3	—	−0·5	61·1	—	—	—	—	—	—	—	—	—	—
81·4	81·4	76·9	77·6	77·6	105·8	105·0	4·5	64·9	86·0	71·1	59·9	56·4	55·7	—	32·6	75·5	79·7	—
75·6	—	—	—	—	—	—	—	60·6?	—	—	—	—	—	—	46·2	81·5	—	—
—	—	—	—	—	—	—	—	—	—	73·7	63·0	55·4	55·5	44·1	26·0	76·7	75·1	82·6
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	82·5	—
81·8	—	72·7	—	—	112·5	—	9·1	60·3?	—	—	—	—	—	—	—	—	—	—
79·8	79·8	78·9	80·1	80·1	101·5	99·6	0·9	64·1	87·3	78·7?	54·2	53·2	53·0	—	54·1	77·1?	82·0	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48·6?	—	—	—
80·4	—	77·6	—	—	103·5	—	2·8	62·5	81·7	—	—	—	—	—	54·4?	—	—	—
75·5	75·5	—	—	—	—	—	—	64·1	74·9	76·2	56·3	51·0	52·5	48·2	43·2	78·7	79·6	83·6
—	—	—	—	—	—	—	—	60·1?	81·5	72·8	55·6	53·2	53·4	—	—	83·7	—	—
—	—	73·3	—	—	—	—	—	59·6	80·0	—	—	—	—	—	—	—	—	—
—	—	67·9	—	—	—	—	—	56·5?	86·8	—	47·7?	—	47·1	—	41·1	—	86·0	—
—	—	75·5	—	—	—	—	—	66·4	81·3	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	77·3	—	—
80·6	81·1	71·1	71·6	72·0	113·4	112·5	9·6	58·5	76·5	67·9?	58·2	54·2	54·6	—	24·8	80·7	79·8	—
78·2	78·5	76·4	75·5	75·8	102·4	103·6	1·8	59·5?	80·3	72·4?	49·8	48·9	47·9	—	—	77·4	78·0	—
86·4	—	76·5	—	—	113·6	—	9·9	63·6	78·9	—	—	—	—	—	—	—	74·6?	—
—	—	—	—	—	105·5	—	—	62·1	94·2	—	—	—	—	—	—	—	—	—
—	—	—	—	—	107·1	107·5	—	64·9	91·0?	—	—	—	—	—	—	85·0?	—	—
—	—	—	—	—	—	—	—	—	—	—	56·0	52·5	52·5	—	43·0	—	85·7	—

100 $\frac{O_2}{O_1}, L$	100 $\frac{O_2}{O_1''}, R$	100 $\frac{O_2}{O_1''}, L$	100 $\frac{O_2}{Lacr.\ O_1}, R$	100 $\frac{O_2}{Lacr.\ O_1}, L$	100 $\frac{G_2}{G_1}$	100 $\frac{G_2}{G_1'}$	100 $\frac{EH}{G_2}$	$N\angle$	$A\angle$	$B\angle$	$\frac{Alv.}{P}\angle$	$\frac{Pros.}{P}\angle$	θ_1	θ_2	
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sutures closed. JR.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Occipito-mastoid suture R. obliter
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	J—.
85·0	—	—	—	—	—	—	—	60°·0	71°·5	48°·5	87°·5?	87°·2?	32°·6?	14°·7?	Ageing; sagittal suture obliterated.
84·8	—	—	—	—	—	—	27·3	64°·4	72°·5	43°·1	79°·9	78°·5	35°·7	7°·4	Wormians in lambdoid suture R. a
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Numerous wormians in lambdoid s
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormian in lambdoid suture L.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	JR. Small spine projecting posteri
72·9	75·3	78·0	76·7	79·2	82·4	92·0	25·3	—	—	—	84°·0	83°·7	—	—	Teeth worn but none lost before de
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture closed at obelion. T
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture closed, coru
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Tympanic perforation R. and L. J
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; all sutures closed. Wormia
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures begi
84·7	84·1	86·2	87·8	89·1	—	—	—	67°·0	70°·2	42°·8	83°·0	80°·9	30°·1	12°·8	Sagittal and lambdoid sutures begi
84·0	89·2	—	90·6	—	—	—	—	—	—	—	—	—	—	—	All sutures closing. Double ossicle
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture closing. Large ossic
79·7	78·2	83·0	82·8	86·4	81·5	89·0	45·6	65°·2	72°·8	42°·8	86°·8	85°·8	26°·8	11°·8	Aged; sagittal suture quite, lambd before death.
79·6	82·0	82·0	88·9	86·6	—	—	—	63°·5	72°·7	43°·8	89°·0	87°·9	27°·5	16°·3	All sutures closing. Wormians in la
79·7	—	82·7	—	—	—	—	—	70°·9?	72°·9?	36°·2?	80°·0?	78°·5?	29°·1?	7°·1?	Wormians in lambdoid suture R. a
—	—	—	—	—	—	—	—	58°·9?	80°·1?	41°·0?	92°·9?	90°·9	28°·2?	12°·8?	Wormian in lambdoid suture R. C
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Aged; sagittal suture quite, corona
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures begi
82·6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture beginning to close.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Numerous wormians in lambdoid s
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture closed, lambdoid su
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture partly oblit
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Aged; all sutures obliterated. Tym
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ossicles at asteria and ossicle in pa
76·9	76·7	—	80·1?	—	—	—	19·9?	69°·0?	73°·2?	37°·8?	83°·7	83°·0	27°·3?	14°·7?	Sagittal and lambdoid sutures clos 2 premolars lost before death.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. a
85·9	—	—	—	—	84·6	92·1	28·2?	—	—	—	—	—	—	—	Sagittal and coronal sutures closing
77·9	79·7	—	84·6	—	—	—	—	67°·9	70°·3	41°·8	—	—	—	—	Sagittal and coronal sutures closin
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture closing, lambdoid l
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Aged; all sutures nearly obliterated
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture nearly oblit
77·7	80·2	83·8	84·1	86·9	82·3?	90·5?	21·4?	64°·6	76°·4	39°·0	87°·1?	86°·2	28°·3?	10°·7?	Sagittal and lambdoid sutures clos
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture partly obli
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. a
79·8	82·5	84·8	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal and coronal sutur
—	—	—	—	—	—	—	—	65°·4?	74°·1?	40°·5?	—	—	—	—	Sagittal and coronal sutures closing
80·3	82·1	83·0	—	86·4	95·6	105·6	19·0	69°·7	72°·4	37°·9	85°·9	84°·7	24°·4	13°·5	Aged; all sutures nearly obliterated perforation L. Palatine torus.
78·6	83·0	80·5	84·0	81·9	—	—	—	60°·1	77°·1	42°·8	93°·0	92°·5	26°·9	15°·9	Aged; all sutures partly obliterated
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures clos
79·5	—	—	—	—	—	—	—	64°·2?	74°·7?	41°·1?	87°·4	85°·2	28°·4?	12°·7?	Ageing; sagittal suture partly obli
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture partly obli
82·3?	—	—	—	—	—	—	—	—	—	—	87°·5	86°·0	—	—	No teeth lost R. before death.
83·5?	—	87·6?	—	89·9?	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures clos
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures clos
79·7	—	—	—	—	—	—	—	68°·6	75°·2	36°·2	86°·1	85°·2	25°·3	10°·9	Sagittal and lambdoid sutures clos
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture partly obli
75·1	82·6	80·0	85·3	83·6	—	91·2?	27·5?	—	—	—	—	—	—	—	Broad nasal bones with irregular l
82·5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Metopic.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Aged; all sutures nearly obliterated
82·0	—	—	—	—	—	—	—	68°·5?	69°·5?	42°·0?	81°·8	80°·5	30°·0?	12°·0?	Wormians in lambdoid suture R. a
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. a
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture nearly obli
79·6	83·6	84·9	85·7	—	—	—	—	70°·0	69°·1	40°·9	78°·5	78°·0	31°·5	9°·4	Wormians in lambdoid suture L.
—	—	—	—	—	—	—	—	65°·0	75°·1	39°·9	83°·6?	80°·8?	31°·4?	8°·5?	Sagittal and lambdoid sutures clos
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal suture nearly closed, coron
86·0	—	89·5	—	94·8	—	—	—	—	—	—	—	—	—	—	All sutures beginning to close. No
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. a
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures clos
79·8	—	—	—	—	99·5	110·7	20·0	64°·7?	75°·1?	40°·2?	88°·5	85°·8	26°·8?	13°·4?	Wormian in lambdoid suture L. M
78·0	—	80·7	—	84·1	—	—	—	61°·0?	81°·7?	37°·3?	87°·8	85°·5	33°·2?	4°·1?	Sagittal suture closed, lambdoid cl
74·6?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormian in lambdoid suture L. F
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Wormian in lambdoid suture R. a
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ageing; sagittal suture closed, cor
85·7	—	91·3	—	95·0	—	—	—	—	—	—	—	—	—	—	Lambdoid suture closing. Teeth co

	Pros. P∠	θ_1	θ_2	Remarks
	—	—	—	Ageing; sutures closed. JR.
	—	—	—	Occipito-mastoid suture R. obliterated, all other sutures open. JL.
	—	—	—	J=.
?	87°·2?	32°·6?	14°·7?	Ageing; sagittal suture obliterated, coronal closed, lambdoid closing. No 3rd molars? 3 teeth lost before death. JR.
	78°·5	35°·7	7°·4	Wormians in lambdoid suture R. and L. Teeth slightly worn. JR.
	—	—	—	Numerous wormians in lambdoid suture R. and L. Precondyles. Jugular foramen R. divided. Everted edge of foramen magnum.
	—	—	—	Wormian in lambdoid suture L.
	—	—	—	JR. Small spine projecting posteriorly from above basion.
	83°·7	—	—	Teeth worn but none lost before death. 1 or more epipteric bones R.
	—	—	—	Sagittal suture closed at obelion. Teeth considerably worn.
	—	—	—	Ageing; sagittal suture closed, coronal and lambdoid beginning to close. Slight tympanic perforation R. and L. JR.
	—	—	—	Tympanic perforation R. and L. JR.
	—	—	—	Ageing; all sutures closed. Wormians in lambdoid R.
	—	—	—	Sagittal and lambdoid sutures beginning to close. Wormian in lambdoid R. Tympanic perforation R. JL.
	80°·9	30°·1	12°·8	Sagittal and lambdoid sutures beginning to close. Ossicles at asteria. All teeth *in situ*, 5 molars diseased. J=.
	—	—	—	All sutures closing. Double ossicle of λ. Single excrescence in median plane posterior to basion.
	—	—	—	Sagittal suture closing. Large ossicle of λ.
	85°·8	26°·8	11°·8	Aged; sagittal suture quite, lambdoid and coronal partly obliterated. Ossicle at asterion L. Precondyles. JR. Asymmetrical palate, L. side deepe before death.
	87°·9	27°·5	16°·3	All sutures closing. Wormians in lambdoid R. Ossicle of λ. Tympanic perforation R. and L. J=. Teeth considerably worn but none lost before deat
?	78°·5?	29°·1?	7°·1?	Wormians in lambdoid suture R. and L. Tympanic perforation L. JR. Asymmetrical. Small epipteric bone R. Teeth worn but none lost before dea
?	90°·9	28°·2?	12°·8?	Wormian in lambdoid suture R. Ossicle in coronal R. Metopic LF+RP 7 mm. Epipteric bones R. and L. JL. Median sagittal ridge. Teeth worn b
	—	—	—	Aged; sagittal suture quite, coronal and lambdoid partly obliterated. Precondyles. JL. Irregular border of foramen magnum.
	—	—	—	Sagittal and lambdoid sutures beginning to close. Wormians in lambdoid R. and L. Metopic RF+LP 4 mm. Large precondyles. JL.
	—	—	—	Sagittal suture beginning to close. Ossicle of λ. Metopic LF+RP 4 mm. Most teeth lost before death.
	—	—	—	Numerous wormians in lambdoid suture R. and L. Ossicles in coronal R. and L., ossicle in sagittal near bregma. Metopic suture only open near br
	—	—	—	Sagittal suture closed, lambdoid nearly closed, coronal closing. Wormians in lambdoid R. and L. Metopic LF+RP 4·5 mm. J=.
	—	—	—	Ageing; sagittal suture partly obliterated, lambdoid and coronal closing. Ossicle at asterion L. Epipteric bone R. Copper stain on frontal bone.
	—	—	—	Aged; all sutures obliterated. Tympanic perforation R. and L.
	—	—	—	Ossicles at asteria and ossicle in parieto-mastoid suture L. JR.
	83°·0	27°·3?	14°·7?	Sagittal and lambdoid sutures closing. Ossicle of λ. Metopic suture only visible near bregma LF+RP 3 mm. J=. No teeth lost from upper jaw b 2 premolars lost before death.
	—	—	—	Wormians in lambdoid suture R. and L. Epipteric bone L. JR.
	—	—	—	Sagittal and coronal sutures closing. Epipteric bone L. Teeth worn but none lost before death.
	—	—	—	Sagittal and coronal sutures closing. Wormians in lambdoid R. and L. No teeth lost R. before death.
	—	—	—	Sagittal suture closing, lambdoid beginning to close. Wormians in lambdoid L. Ossicle in coronal L. Asymmetrical foramen magnum. JL.
	—	—	—	Aged; all sutures nearly obliterated. JL.
	—	—	—	Ageing; sagittal suture nearly obliterated, coronal and lambdoid nearly closed. Small double *os épactal*.
?	86°·2	28°·3?	10°·7?	Sagittal and lambdoid sutures closing. Metopic LF+RP. Slight tympanic perforation R. JR. Teeth worn but none lost before death. M_3L not er
	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. Small epipteric bone L. JR.
	—	—	—	Wormians in lambdoid suture R. and L.
	—	—	—	Ageing; sagittal and coronal sutures closed. JL. No teeth lost before death; 3rd molars not erupted.
	—	—	—	Sagittal and coronal sutures closing. 2 carious teeth; 1 molar lost before death.
	84°·7	24°·4	13°·5	Aged; all sutures nearly obliterated. Small epipteric bone L. JR. Mandible; no teeth lost from either jaw before death, but upper M_3R and lower M perforation L. Palatine torus.
	92°·5	26°·9	15°·9	Aged; all sutures partly obliterated. Wormians in lambdoid R. and L. JR. Exostosis at asterion R. Mandible; teeth considerably worn and 3 carie
	—	—	—	Sagittal and lambdoid sutures closing. JL. Ossicles between temporal squamae and parietal bones.
	85°·2	28°·4?	12°·7?	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. JL. Teeth worn but none lost before de
	—	—	—	Ageing; sagittal suture partly obliterated, coronal and lambdoid closing. Wormian in lambdoid R. Tympanic perforation L. Flattening at obelion.
	86°·0	—	—	No teeth lost R. before death.
	—	—	—	Sagittal and lambdoid sutures closing. Ossicle in sagittal above λ. Epipteric bone L. Precondyles. JR. No teeth lost L. before death and no M_3L.
	—	—	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L.
	85°·2	25°·3	10°·9	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. Ossicles in coronal R. and L. J=. Teeth moderately worn and none lost b
	—	—	—	Ageing; sagittal suture partly obliterated, lambdoid nearly closed, coronal beginning to close. Wormians in lambdoid R. and L. Teeth worn but non
	—	—	—	Broad nasal bones with irregular lower margins. Teeth moderately worn and none lost before death.
	—	—	—	Metopic.
	—	—	—	Aged; all sutures nearly obliterated.
	80°·5	30°·0?	12°·0?	Wormians in lambdoid suture R. and L. JL. No teeth lost before death (?); 1 remaining tooth worn. Single premolar L.
	—	—	—	Wormians in lambdoid suture R. and L.
	—	—	—	Ageing; sagittal suture nearly obliterated, coronal and lambdoid closing. Wormians in lambdoid R. and L. Epipteric bone R. JL.
	78°·0	31°·5	9°·4	Wormians in lambdoid suture L. Epipteric bone L. JR. No teeth lost before death.
?	80°·8?	31°·4?	8°·5?	Sagittal and lambdoid sutures closed. Wormians in lambdoid R. and L. JR. Teeth worn but none lost before death.
	—	—	—	Sagittal suture nearly closed, coronal and lambdoid closing. Wormians in lambdoid R. and L. Epipteric bone L.
	—	—	—	All sutures beginning to close. No teeth lost L. before death.
	—	—	—	Wormians in lambdoid suture R. and L. Basal suture partly open.
	—	—	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. Ossicles at λ and asterion R. Bathrocephalic. No teeth lost R. before dea
	85°·8	26°·8?	13°·4?	Wormian in lambdoid suture L. Metopic RF+LP 2·5 mm. Epipteric bone R. JR. Teeth hardly worn and none lost before death.
	85°·5	33°·2?	4°·1?	Sagittal suture closed, lambdoid closing, coronal beginning to close. Wormians in lambdoid R. and L. Ossicle of λ. JR. Probably no teeth lost bef
	—	—	—	Wormian in lambdoid suture L. Fossa pharyngea.
	—	—	—	Wormian in lambdoid suture R. and L. and parieto-mastoid suture R. JR. Fossa pharyngea.
	—	—	—	Ageing; sagittal suture closed, coronal and lambdoid closing. JR. Asymmetrical foramen magnum. No teeth lost R. before death.
	—	—	—	Lambdoid suture closing. Teeth considerably worn; 1 lost L. before death; 1 carious premolar.

late, L. side deeper than R. Teeth worn but none lost

ne lost before death.
one lost before death.
idge. Teeth worn but none lost before death.

JL.

only open near bregma LF + RP. Bathrocephalic.

on frontal bone.

from upper jaw before death. Mandible; no 3rd molars,

num. JL.

death. M_3L not erupted.
L. JR.

r M_3R and lower M_3's not erupted. Teeth worn. Tympanic

y worn and 3 carious; 19 or more present at death.

none lost before death (?).
tening at obelion.

death and no M_3L.

orn and none lost before death; no 3rd molars.
Teeth worn but none lost R. before death (?).

L.

n lost R. before death.
h.
ly no teeth lost before death

ath.

No.	Sex	*IOW*	*B′*	*B″*	*B*	*Binsterionic B*	*F*	*L*	S_1'	S_2'	S_3'	S_1	S_2	S_3	*S*	*U*	
2	♀?	97·5	97·7	122·5	140	114·5	170	171	—	111·6?	92·8	—	123·5?	109	—	—	
8	♀	88·5?	93·3	117?	—	—	174·5	174·5	—	106·6	97·3	—	121?	114·5	—	—	
16	♀?	96·5?	94·2	—	—	105	160·5	162	—	108·0	88·0	—	122·5	102	—	—	
19	,,	—	88·9	118	—	—	167·5	167·5	—	105·3	—	—	118	—	—	—	
60	,,	—	—	—	—	105	—	—	—	113·0	92·9	—	123·5	116·5	—	—	
74	,,	—	—	—	—	104?	—	—	—	—	—	—	—	—	—	—	
115	♀	—	97·3	—	141·5	105·5	177·5	177·5	113·5	102·0	98·4	134	115	116·5	365	—	
119	♀?	—	90·9	122	138·5	—	176	178	105·6	114·0	98·3	122	130	121	372	—	
124	,,	—	96·9	—	139	—	178	180·5	110·8	110·9	97·2	126	123	113·5	362	—	
128	,,	—	101·3	—	—	—	164·5	167	111·7	102·3	95·7	126	116	105	348	—	
144	,,	—	—	—	150·5	—	—	—	116·0	104·9	—	137	115·5	—	—	—	
223	♀	87·5	87·8	106	127	103·5?	162	162	99·1	99·0	90·9	114	109	108·5	332	—	
225	♀?	89·5	92·7	—	141·5	104·5	174·5	177	—	—	—	—	—	—	—	—	
230	,,	91	92·6	—	146	118·5?	179	179	—	—	102·2	—	—	124·5	—	—	
235	,,	91·5	88·2	—	143	—	175	177	—	—	—	—	—	—	—	—	
237	,,	96	102·4	—	140	—	181	181	108·0	100·8	94·9	124·5	110	117·5	353	—	
238	,,	98·5	98·7	122·5	145	111	163	163	102·1	103·4	92·3	117·5	117	111	345	—	
244	,,	—	—	118	135·5	105·5	163	163	—	—	—	—	—	—	—	—	
246	,,	94	96·1	—	—	—	178	178	108·4	—	—	123	—	—	—	—	
247	,,	94·5	100·4	117	131	—	—	—	107·8	—	—	125	—	—	—	—	
255	,,	93·5	91·7	—	138	—	166	166	—	103·5	89·4	—	116·5?	104	—	—	
310	,,	93	90·9	—	140	115?	176·5	177	111·2	109·6?	89·0?	130	122?	103·5?	356	507	
313	,,	90?	90·8	112	133	107·5	170	170·5	103·0	102·6	103·9	116	115·5	128	360·5	—	
321	,,	—	—	120·5	143	116·5?	—	179	—	103·1	95·6	—	113	116	—	—	
333	,,	98·5	97·1	—	133·5	—	181	181	107·9	111·0	95·1	125·5	120	116?	361	—	
350	,,	—	—	—	—	—	172	172·5	106·1	106·3?	—	121·5	117·5?	—	—	—	
360	,,	—	—	—	—	107·5?	—	163·5	—	—	88·5?	—	—	102·5?	—	—	
361	,,	—	—	—	136	—	170·5	170·5	—	110·0?	87·9?	—	124·5?	103?	—	—	
366	,,	—	89·1	110?	—	99·5?	161·5	162	101·6	—	—	116	—	—	—	—	
375	,,	—	—	—	—	—	172·5	174	105·3	103·9?	—	129	114?	—	—	—	
418	,,	93	93·0	120	139	108?	171	171	105·5	104·6	93·0	122	118	108·5	349·5	—	
433	,,	—	89·1	—	133	—	163	164·5	111·4	91·7?	90·2?	125·5	99	104·5?	330?	475	
440	,,	—	90·5	—	—	—	186·5	187	107·0	—	—	120	—	—	—	—	
452	,,	—	—	—	—	—	—	175·5	—	—	91·0	—	—	107?	—	—	
474	,,	—	—	—	141	108?	—	167·5?	—	—	—	—	—	—	—	—	
528	,,	—	—	121	136	110·5?	178	178	108·9	107·1	92·6	124	118	110·5	353·5	—	
529	,,	—	—	—	137	—	181	182·5	109·6	110·9	—	120·5	124·5	—	—	—	
532	,,	98?	95·0	122?	151	112	166·5	168	108·1	—	—	119·5	—	—	—	—	
536	,,	—	97·2	117	137	—	169·5	170	103·2	110·5	—	114	121	—	—	—	
539	,,	—	92·2	114·5	137·5	—	171	172·5	106·6	109·1	85·5	120	121·5	113	355·5	—	
545	,,	96·5	98·3	—	—	104?	166	167	105·5	108·6	90·6	123	121·5	109	353	—	
562	,,	91·5	89·0	—	—	—	170	170	106·2	102·3	94·7	118·5	111·5	109	339·5	—	
575	,,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
595	,,	94·5	93·0	—	—	—	169	170	101·0	—	—	111	—	—	—	—	
609	,,	95·5	93·6	106·5	132	106·5?	172	172	108·5	106·3	87·6	123	117	106	346	—	
632	,,	—	—	119	137·5	—	180·5	181	—	—	—	—	—	—	—	—	
638	,,	100	95·0	114·5	132	—	162	162·5	103·9	103·3	83·5	117	116	100	334	—	
640	,,	—	—	—	139	—	178	180	106·2	—	—	118·5	—	—	—	—	
648	,,	92·5	90·8	121·5	139	—	166	166	107·0	—	—	121	—	—	—	—	
666	,,	97	88·2	116·5	—	—	169·5	170·5	103·9	107·6	—	115·5	117	—	—	—	
669	,,	—	—	123	143·5?	—	175	176	106·0	109·5	—	116·5	123	—	—	—	
710	♀?	91	90·6	113·5?	133	105·5	174	174	109·9	103·0?	85·2	125·5	111·5?	103·5?	341	—	
722	,,	—	—	—	144	—	165	165·5	96·8	—	—	106·5	—	—	—	—	
746	,,	—	—	—	—	102	—	—	—	—	88·2	—	—	100	—	—	
759	,,	—	—	—	—	112	—	—	—	—	—	—	—	—	—	—	
767	,,	—	—	—	—	—	168·5	168·5	—	—	—	—	—	—	—	—	
805	,,	—	—	119·5	133·5	106	172·5	173	102·2	99·6?	104·5?	116·5?	107?	127?	350·5	494	
809	,,	93	95·9	—	136	—	175·5	175	103·8	106·9	96·6	119	115	117·5	352·5	—	
816	,,	91	87·1	109	132·5	104·5	166·5	167	106·1	88·6	103·9	121	92	124·5	338	—	
817	,,	99	104·5	—	141·5	—	181·5	182	121·9	112·4	93·7	136	124	112	372	—	
818	,,	86·5	83·4	112	131	—	166·5	167·5	105·0	100·9	—	114·5	113	—	—	—	
822	,,	—	93·1	113·5	133	—	173·5	173·5	106·3	103·0	94·0	125	113·5	113	351·5	—	
827	,,	—	90·4	128·5?	151	109	165·5	165	113·8	114·5	89·9?	131·5	129?	102?	363·5	—	
829	,,	—	96·5	—	135	—	182·5	183	101·4	111·8	89·0	124	127	109	359·5	—	
833	,,	95?	94·3	120	131·5	108	174	174	—	—	—	—	—	—	—	499	
844	,,	—	—	120	—	—	168	168	103·2	100·1?	102·8?	116	110?	122?	349	—	
874	,,	—	—	—	—	110·5?	—	—	—	—	96·0	—	—	113·5	—	—	

Individual Measurements of Spitalfields Skulls. X. *Female Calvariae.*

S	U	Broca's Q'	Bregmatic Q'	fml	fmb	100 B/L	Oc. I.	100 fmb/fml	Remarks
—	—	313	317	—	—	81·9	62·1	—	Sutures beginning to close. Ossicles at asteria.
—	—	—	—	—	—	—	61·6	—	——
—	—	—	—	—	—	—	63·9	—	——
—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture L. Asymmetrical.
—	—	—	—	—	—	—	60·3	—	Wormians in lambdoid suture R. and L.
—	—	—	—	30·9	31·6	—	—	102·3	Wormians in lambdoid suture R. and L. and round λ.
65	—	—	—	—	—	77·8	61·3	—	Sagittal suture closed at obelion, lambdoid beginning to close, coronal open. Worn
72	—	—	—	—	—	77·8	58·0	—	——
62	—	—	—	—	—	77·0	62·9	—	——
48	—	—	—	—	—	—	75·3	—	Ageing; sagittal suture almost obliterated, coronal and lambdoid closing.
—	—	—	—	—	—	—	—	—	Prominent frontal bosses.
32	—	—	—	—	—	78·4	60·5	—	Wormian in lambdoid suture R.
—	—	—	—	—	—	79·9	—	—	Sagittal suture closed at obelion, lambdoid closing, coronal beginning to close. Os
—	—	—	—	—	—	81·6	58·8	—	Numerous wormians in lambdoid suture R. and L.
—	—	—	—	32·9	26·3	80·8	—	79·9	Ageing; sagittal suture obliterated, lambdoid and coronal closed. Wormians in l JR. Mandible.
53	—	—	—	—	—	77·3	57·6	—	Wormian in lambdoid suture R.
45	—	—	—	—	—	89·0	59·8	—	Sagittal suture closing, lambdoid beginning to close, coronal open. Wormian in la
—	—	—	—	—	—	83·1	—	—	——
—	—	—	—	—	—	—	—	—	Sagittal suture closing, lambdoid beginning to close, coronal open. Wormian in la
—	—	293·5	299	—	—	—	—	—	Sagittal and coronal sutures beginning to close. Ossicle in coronal L. Metopic LF + Tympanic perforation L.
—	—	—	—	—	—	83·1	63·4	—	——
356	507	291	299	—	—	79·1	63·4?	—	Sagittal suture closing, lambdoid and coronal beginning to close. Large ossicle o on frontal bone.
360·5	—	—	—	—	—	78·0	57·9	—	Small wormians in lambdoid suture R. and L.
—	—	—	—	—	—	79·9	59·1	—	Asymmetrical.
361	—	—	—	—	—	73·8	58·6?	—	Wormians in lambdoid suture L. Ossicle of lambda.
—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. Ossicle of lambda.
—	—	—	—	—	—	—	64·0?	—	Wormians in lambdoid suture R. and L. Metopic LF + RP.
—	—	—	—	—	—	79·8	62·5?	—	Sagittal suture closing, lambdoid beginning to close, coronal open. Wormians in la
—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. and L. Metopic LF + RP.
—	—	—	—	—	—	—	—	—	All sutures closing. Wormians in lambdoid suture R. and L. and ossicle of λ. Me
349·5	—	—	—	—	—	81·3	63·0	—	Wormians in lambdoid suture R. and L. Asymmetrical.
330?	475	288·5	295·5	—	26·6	80·9	63·9?	—	Sagittal suture closed and obliterated at obelion, lambdoid closing, coronal beginni Ossicle at asterion L. Small epipteric bone L. JR.
—	—	—	—	—	—	—	—	—	Wormian in lambdoid suture R. Metopic RF + LP 2 mm. Asymmetrical.
—	—	—	—	—	—	—	62·1?	—	Sagittal suture closed, lambdoid closing, coronal beginning to close. Epipteric bo
—	—	—	—	—	—	84·2?	—	—	Sagittal suture closing. Numerous ossicles in lambdoid suture R. and L. and rou
353·5	—	—	—	—	—	76·4	60·6	—	Metopic LF + RP 5·5 mm.
—	—	—	—	—	—	75·1	—	—	Aged; all sutures closed and almost obliterated. 2 small exostoses on frontal bon
—	—	306	314	—	—	89·9	—	—	Sagittal and lambdoid sutures partly closed, coronal beginning to close. Wormian
—	—	—	—	—	—	80·6	—	—	Wormian in lambdoid L. Asymmetrical.
355·5	—	—	—	—	—	79·7	54·7	—	Sagittal suture closed at obelion, lambdoid and coronal beginning to close. Epipt
353	—	—	—	—	—	—	59·8	—	Sagittal suture closed at obelion.
339·5	—	—	—	—	—	—	64·9	—	Sagittal and lambdoid sutures closing, coronal open.
—	—	—	—	34·0	28·6	—	—	84·1	Sagittal and lambdoid sutures beginning to close. Wormians in lambdoid R. and
—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. and L.
346	—	—	—	—	—	76·7	59·3	—	Ageing; sagittal suture closed, coronal nearly closed, lambdoid closing.
—	—	—	—	—	—	76·0	—	—	Wormians in lambdoid suture R. and L. Ossicles of λ and bregma.
334	—	—	—	—	—	81·2	60·1	—	All sutures closing. Asymmetrical.
—	—	—	—	—	—	77·2	—	—	Wormians in lambdoid suture R. and L. Flattening at obelion.
—	—	—	—	—	—	83·7	—	—	Numerous wormians in lambdoid suture R. and L. Ossicle of λ. Metopic LF + R
—	—	—	—	—	—	—	—	—	Sagittal and lambdoid sutures closing, coronal open. Wormian in lambdoid L. D
—	—	—	—	—	—	81·5?	—	—	Aged; sagittal suture nearly obliterated, coronal nearly closed. Wormians in lamb
341	—	—	—	—	—	76·4	59·0?	—	Aged; sagittal suture obliterated, lambdoid and coronal closed. Projecting occipi
—	—	—	—	—	—	87·0	—	—	Ageing; sagittal and lambdoid sutures nearly closed, coronal closing.
—	—	297·5	305	34·3	28·9	—	67·3	84·3	Wormians in lambdoid suture R. and L. JL. Asymmetrical.
—	—	—	—	37·4	27·2	—	—	72·7	Aged; all sutures obliterated. JR.
—	—	—	—	—	—	—	—	—	Wormians in lambdoid suture R. and L. Ossicles at λ and in sagittal suture imm
350·5	494	291	294·5	—	—	78·3	59·0?	—	Ageing; sagittal suture closed, lambdoid and coronal beginning to close. Wormi
352·5	—	—	—	—	—	77·5	58·9	—	Sagittal and lambdoid sutures closing, coronal open.
338	—	—	—	—	—	79·3	60·1	—	Sagittal and lambdoid sutures closing.
372	—	—	—	—	—	77·7	60·4	—	Ageing; all sutures nearly closed. Wormian in lambdoid L.
—	—	—	—	—	—	78·2	—	—	Wormians in lambdoid suture R. and L. Tympanic perforation L.
351·5	—	—	—	—	—	76·7	59·9	—	——
363·5	—	—	—	32·4	28·3	91·5	67·2?	87·3	Sagittal suture nearly obliterated, lambdoid partly obliterated, coronal open. As
359·5	—	—	—	—	—	73·8	58·3	—	——
—	499	286	293·5	—	—	75·6	—	—	Aged; sagittal and lambdoid sutures nearly obliterated, coronal partly closed. Meto
349	—	—	—	—	—	—	61·1?	—	Ageing; all sutures nearly closed. Wormians in lambdoid R. and L.
—	—	—	—	35·6	29·0	—	—	81·5	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. Fossa p

Remarks	No.	Sex
Sutures beginning to close. Ossicles at asteria.	13	♀?
	50	,,
	54	,,
Wormians in lambdoid suture L. Asymmetrical.	57	,,
Wormians in lambdoid suture R. and L.	71	,,
Wormians in lambdoid suture R. and L. and round λ.	75	,,
Sagittal suture closed at obelion, lambdoid beginning to close, coronal open. Wormians in lambdoid R.	77	,,
	80	♀
	81	,,
Ageing; sagittal suture almost obliterated, coronal and lambdoid closing.	90	♀?
Prominent frontal bosses.	91	,,
Wormian in lambdoid suture R.	146	,,
Sagittal suture closed at obelion, lambdoid closing, coronal beginning to close. Ossicle at asterion L.	149	,,
Numerous wormians in lambdoid suture R. and L.	151	,,
Ageing; sagittal suture obliterated, lambdoid and coronal closed. Wormians in lambdoid R. and L. Ossicle at asterion L. JR. Mandible.	155	,,
Wormian in lambdoid suture R.	163	,,
Sagittal suture closing, lambdoid beginning to close, coronal open. Wormian in lambdoid R.	165	,,
	170	,,
Sagittal suture closing, lambdoid beginning to close, coronal open. Wormian in lambdoid R., ossicle of λ.	172	♀♀?
Sagittal and coronal sutures beginning to close. Ossicle in coronal L. Metopic LF + RP 4 mm. Small epipteric bones R. and L. Tympanic perforation L.	179	♀
	182	,,
Sagittal suture closing, lambdoid and coronal beginning to close. Large ossicle of λ. Small epipteric bone R. Healed wound on frontal bone.	185	,,
Small wormians in lambdoid suture R. and L.	189	,,
Asymmetrical.	192	,,
Wormians in lambdoid suture L. Ossicle of lambda.	249	,,
Wormians in lambdoid suture R. Ossicle of lambda.	262	,,
Wormians in lambdoid suture R. and L. Metopic LF + RP.	264	,,
Sagittal suture closing, lambdoid beginning to close, coronal open. Wormians in lambdoid L. Ossicle in sagittal at obelion.	267	,,
Wormians in lambdoid suture R. and L. Metopic LF + RP.	271	,,
All sutures closing. Wormians in lambdoid suture R. and L. and ossicle of λ. Metopic RF + LP 2 mm. Bathrocephalic.	277	,,
Wormians in lambdoid suture R. and L. Asymmetrical.	279	,,
Sagittal suture closed and obliterated at obelion, lambdoid closing, coronal beginning to close. Wormians in lambdoid R. and L. Ossicle at asterion L. Small epipteric bone L. JR.	284	,,
Wormian in lambdoid suture R. Metopic RF + LP 2 mm. Asymmetrical.	285	,,
Sagittal suture closed, lambdoid closing, coronal beginning to close. Epipteric bone L.	287	,,
Sagittal suture closing. Numerous ossicles in lambdoid suture R. and L. and round λ.	367	,,
Metopic LF + RP 5·5 mm.	370	,,
Aged; all sutures closed and almost obliterated. 2 small exostoses on frontal bone.	374	,,
Sagittal and lambdoid sutures partly closed, coronal beginning to close. Wormians in lambdoid R. Ossicle of λ.	382	,,
Wormian in lambdoid L. Asymmetrical.	396	,,
Sagittal suture closed at obelion, lambdoid and coronal beginning to close. Epipteric bone R.	468	,,
Sagittal suture closed at obelion.	482	,,
Sagittal and lambdoid sutures closing, coronal open.	499 A	,,
Sagittal and lambdoid sutures beginning to close. Wormians in lambdoid R. and L. Ossicle in sagittal.	535	,,
Wormians in lambdoid suture R. and L.	537	,,
Ageing; sagittal suture closed, coronal nearly closed, lambdoid closing.	551	,,
Wormians in lambdoid suture R. and L. Ossicles of λ and bregma.	579	,,
All sutures closing. Asymmetrical.	583	,,
Wormians in lambdoid suture R. and L. Flattening at obelion.	589	,,
Numerous wormians in lambdoid suture R. and L. Ossicle of λ. Metopic LF + RP 3 mm. Flattening at obelion.	597	,,
Sagittal and lambdoid sutures closing, coronal open. Wormian in lambdoid L. Depression at obelion.	598	,,
Aged; sagittal suture nearly obliterated, coronal nearly closed. Wormians in lambdoid R. and L. Tympanic perforation L.	599 A	,,
Aged; sagittal suture obliterated, lambdoid and coronal closed. Projecting occipital.	664	,,
Ageing; sagittal and lambdoid sutures nearly closed, coronal closing.	665	,,
Wormians in lambdoid suture R. and L. JL. Asymmetrical.	679	,,
Aged; all sutures obliterated. JR.	688	,,
Wormians in lambdoid suture R. and L. Ossicles at λ and in sagittal suture immediately above λ.	691	,,
Ageing; sagittal suture closed, lambdoid and coronal beginning to close. Wormian in lambdoid R. Metopic LF + RP 2 mm.	694	,,
Sagittal and lambdoid sutures closing, coronal open.	737	,,
Sagittal and lambdoid sutures closing.	742	,,
Ageing; all sutures nearly closed. Wormian in lambdoid L.	745	,,
Wormians in lambdoid suture R. and L. Tympanic perforation L.	754	,,
	760	,,
Sagittal suture nearly obliterated, lambdoid partly obliterated, coronal open. Asymmetrical.	763	,,
	777	,,
Aged; sagittal and lambdoid sutures nearly obliterated, coronal partly closed. Metopic suture nearly closed LF + RP 3·5 mm.	799	,,
Ageing; all sutures nearly closed. Wormians in lambdoid R. and L.	834	,,
Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. Fossa pharyngea.	847	,,
	862	,,
	864	,,
	878	,,
	884	,,

No.	Sex	*IOW*	*B′*	*B″*	*B*	*Biasterionic B*	*H′*	S_1'	S_2'	S_3'	S_1	S_2	S_3	*S*	*fml*	*fmb*	*Oc. I.*
13	♀?	—	—	—	142	108	—	—	113·0	96·8	—	124	115	—	—	—	61·0
50	,,	—	—	—	—	105	—	—	—	90·0	—	—	104·5	—	—	—	63·6
54	,,	—	—	—	—	103·5	—	—	—	93·0	—	—	113	—	—	—	59·0
57	,,	—	—	—	—	114	—	—	116·3?	98·5?	—	130?	120?	—	—	—	58·8?
71	,,	—	—	—	—	—	—	—	113·0	92·9	—	123·5	116·5	—	—	—	56·9
75	,,	—	—	—	—	—	—	—	—	99·8	—	—	122	—	35·3	25·4	58·5
77	,,	—	—	—	—	—	130?	—	114·6?	100·7	—	125?	121?	—	36·8	—	59·9?
80	♀	95	93·0	—	—	—	—	106·3	—	—	119	—	—	—	—	—	—
81	,,	—	—	—	—	—	—	—	—	91·6	—	—	108·5	—	34·1	28·1	61·3
90	♀?	91	89·5	—	—	—	—	108·0	—	—	121	—	—	—	—	—	—
91	,,	—	—	—	—	107?	—	—	—	93·1	—	—	107	—	—	—	65·1
146	,,	—	—	—	—	—	—	—	—	91·9	—	—	106	—	—	—	64·6
149	,,	—	93·7	—	—	—	—	—	108·2?	—	115·5	125?	—	—	—	—	—
151	,,	—	—	—	—	105·5?	—	105·2	110·6	93·9	—	127	106	—	—	32·3?	68·2
155	,,	—	—	—	138	—	—	—	111·1	95·1	—	121	114	—	—	—	60·1
163	,,	—	—	—	—	110·5	—	—	112·9	95·7	—	125?	117	—	—	—	58·5
165	,,	95·5?	100·7	127	—	—	—	109·8	—	—	129	—	—	—	—	—	—
170	,,	99?	100·2	—	—	—	—	110·9	—	—	134·5	—	—	—	—	—	—
172	♀?	95·5?	93·0	121	—	—	—	109·1	103·7	—	122	116	—	—	—	—	—
179	♀?	—	—	—	—	—	—	—	—	86·6	—	—	102	—	—	—	61·9
182	,,	—	—	—	—	—	—	—	—	100·0	—	—	120	—	—	—	60·0
185	,,	—	—	—	—	—	—	112·0	97·4	97·3	—	124	120	—	—	—	57·9
189	,,	—	—	—	—	—	—	—	—	90·0?	—	—	102·5?	—	39·4	32·9	66·5?
192	,,	—	92·4	—	—	—	—	109·3	—	—	123	—	—	—	—	—	—
249	,,	—	—	—	—	—	—	—	103·4	101·6	—	113	117	—	—	—	64·7
262	,,	—	—	—	138	—	—	—	110·6	90·5	—	121·5	109	—	—	—	60·0
264	,,	—	87·8	115·5?	138	—	—	107·6?	104·8?	—	123?	114?	—	—	—	—	—
267	,,	90	96·9	—	—	—	—	98·9	103·3?	—	112·5	115?	—	—	—	—	—
271	,,	92·5	95·2	—	—	—	—	117·3	—	—	137	—	—	—	—	—	—
277	,,	95	95·1	—	—	—	—	115·0?	—	—	131·5?	—	—	—	—	—	—
279	,,	—	—	—	—	—	—	—	—	102·0?	—	—	120?	—	37·7	30·2	62·1?
284	,,	—	—	—	—	—	—	—	103·3?	92·2?	—	115?	108?	—	—	—	62·5?
285	,,	92	90·0	—	—	—	—	108·1?	—	—	122·5?	—	—	—	—	—	—
287	,,	89·5	87·1	—	—	—	—	99·8	—	—	111	—	—	—	—	—	—
367	,,	—	—	—	—	—	—	—	99·9	93·9	—	111?	109·5	—	—	—	63·1
370	,,	—	—	—	—	—	—	—	—	87·4?	—	—	103?	—	—	—	61·9?
374	,,	—	—	—	135	—	—	—	110·6	92·7	—	123	113	—	—	—	58·7
382	,,	—	93·8	—	—	—	—	108·8?	—	—	121·5?	—	—	—	—	—	—
396	,,	—	—	—	—	—	—	—	—	96·3	—	—	115·5	—	—	—	60·0
468	,,	—	—	—	—	—	—	—	—	93·0	—	—	107	—	—	—	64·9
482	,,	—	—	—	—	—	—	—	109·7	91·9	—	121	—	—	33·8	27·3	—
499A	,,	—	—	—	—	—	—	—	—	89·7	—	—	122	—	—	—	54·0
535	,,	—	94·0	120·5	138	—	—	106·6	104·0	—	119	116	—	—	—	—	—
537	,,	91	85·9	112	136·5	—	—	105·8	100·6	94·0	116	110	108	335	—	—	65·7
551	,,	—	—	—	—	107?	—	—	—	87·2	—	—	103	—	—	—	61·6
579	,,	—	96·8	—	—	—	—	108·8	113·1?	—	123	124	—	—	—	—	—
583	,,	—	—	—	135	—	—	—	109·4?	95·5	—	122?	113	—	—	—	61·4
589	,,	—	—	—	138?	—	—	106·7	103·2	—	119	111·5	—	—	—	—	—
597	,,	—	—	—	—	—	—	—	109·1?	91·8?	—	121·5?	106?	—	—	—	64·4?
598	,,	—	—	—	—	—	—	—	104·0?	91·2?	—	115?	106?	—	—	—	63·5?
599A	,,	96	93·1	—	—	—	—	107·9	—	—	120·5	—	—	—	—	—	—
664	,,	—	—	—	—	—	—	—	105·5	91·9	—	119	110	—	—	—	60·2
665	,,	98	98·8	118	—	—	—	106·1	—	—	117	—	—	—	—	—	—
679	,,	—	—	—	139·5	—	—	—	—	86·4	—	—	107	—	—	—	57·6
688	,,	—	—	—	—	—	—	—	99·0	85·9	—	113	102	—	—	—	61·1
691	,,	—	—	114·5	—	—	—	—	100·6	—	—	111	—	—	—	—	—
694	,,	—	—	—	—	—	—	—	—	89·6?	—	—	103?	—	—	—	65·0?
737	,,	—	—	—	136	—	—	—	109·6	92·8	—	121	108	—	—	—	63·3
742	,,	—	—	—	144	112·5	—	—	110·3	81·2	—	123	101·5	—	—	—	57·1
745	,,	—	—	—	—	—	—	—	—	93·5	—	—	114	—	32·4	27·4	58·7
754	,,	—	—	—	—	—	—	—	102·6	88·0	—	115	108	—	—	—	58·2
760	,,	—	—	—	—	—	—	—	102·9?	88·2	—	116?	103	—	31·2	23·9	62·9
763	,,	—	—	—	146·5	—	—	105·2	—	—	121	—	—	—	—	—	—
777	,,	—	—	—	—	—	—	—	98·1?	90·9	—	108?	107	—	—	—	61·9
799	,,	—	—	—	—	99·5?	—	—	—	88·3	—	—	105	—	—	—	60·9
834	,,	—	88·0	—	143	—	—	—	97·6	99·7	—	108	127	—	—	—	56·1
847	,,	—	—	117·5?	—	—	—	107·0	—	—	121·5	—	—	—	—	—	—
862	,,	—	—	—	—	—	—	—	96·6	94·7	—	105	118	—	—	—	57·2
864	,,	—	—	—	—	—	—	—	—	98·2?	—	—	115?	—	39·0	31·4	62·5?
878	,,	94·5	99·0	—	—	119·5	—	107·5	—	—	123	—	—	—	—	—	—
884	,,	—	—	—	—	—	—	—	—	92·2	—	—	110·5	—	—	—	60·1

S_2	S_3	S	*fml*	*fmb*	*Oc. I.*	$\frac{100\ fmb}{fml}$	Remarks
124	115	—	—	—	61·0	—	Ageing; sagittal suture closed, lambdoid closing. Slight tympanic perforation R. and L. Thin bone
—	104·5	—	—	—	63·6	—	Ageing; sutures nearly closed.
—	113	—	—	—	59·0	—	Small wormians in lambdoid suture R. and L.
130?	120?	—	—	—	58·8?	—	Sagittal suture closing.
123·5	116·5	—	—	—	56·9	—	Numerous wormians in lambdoid suture.
—	122	—	35·3	25·4	58·5	72·0	Wormian in lambdoid suture R.
125?	121?	—	36·8	—	59·9?	—	——
—	—	—	—	—	—	—	Sutures nearly closed. Teeth considerably worn but none lost R. before death.
—	108·5	—	34·1	28·1	61·3	82·4	Sagittal and lambdoid sutures closing.
—	—	—	—	—	—	—	Ageing; coronal and sagittal sutures nearly obliterated.
—	107	—	—	—	65·1	—	Wormians in lambdoid suture L. and round λ.
—	106	—	—	—	64·6	—	Tympanic perforation R.
125?	—	—	—	—	—	—	——
127	106	—	—	32·3?	68·2	—	Wormians in lambdoid suture R. and L. Complex sutures.
121	114	—	—	—	60·1	—	Ageing; sagittal suture closed, lambdoid and coronal closing.
125?	117	—	—	—	58·5	—	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L.
—	—	—	—	—	—	—	Sagittal suture closing, coronal beginning to close. Metopic LF + RP 3 mm.
—	—	—	—	—	—	—	Coronal suture closing.
116	—	—	—	—	—	—	——
—	102	—	—	—	61·9	—	Lambdoid suture beginning to close.
—	120	—	—	—	60·0	—	Aged; sagittal and lambdoid sutures closed.
124	120	—	—	—	57·9	—	——
—	102·5?	—	39·4	32·9	66·5?	83·5	——
—	—	—	—	—	—	—	Coronal suture closed.
113	117	—	—	—	64·7	—	——
121·5	109	—	—	—	60·0	—	Wormians in lambdoid suture and ossicle of λ.
114?	—	—	—	—	—	—	——
115?	—	—	—	—	—	—	Sagittal suture obliterated at obelion, but clearly open anteriorly. Coronal and lambdoid open.
—	—	—	—	—	—	—	Wormians in lambdoid suture R. and L.
—	—	—	—	—	—	—	Aged; sagittal suture obliterated, coronal partly obliterated.
—	120?	—	37·7	30·2	62·1?	80·1	Sagittal and lambdoid sutures closing. Wormians in lambdoid R. and L. JR.
115?	108?	—	—	—	62·5?	—	Numerous wormians in lambdoid suture L.
—	—	—	—	—	—	—	Sagittal suture beginning to close.
—	—	—	—	—	—	—	——
111?	109·5	—	—	—	63·1	—	Numerous wormians in lambdoid suture L.
—	103?	—	—	—	61·9?	—	Wormians in lambdoid suture L. Depression at obelion.
123	113	—	—	—	58·7	—	Sagittal and lambdoid sutures beginning to close, coronal open. Wormians in lambdoid R. and L ossicle in coronal L. 3 diseased areas on vault—see Plate III, *b* and *c*.
—	—	—	—	—	—	—	——
—	115·5	—	—	—	60·0	—	Wormians in lambdoid suture R. and L.
—	107	—	—	—	64·9	—	Wormian in lambdoid suture R.
121	—	—	33·8	27·3	—	80·8	Wormians in lambdoid suture R. and L.
—	122	—	—	—	54·0	—	Complex lambdoid suture with numerous wormians R. and L.
116	—	—	—	—	—	—	Thin bones.
110	108	335	—	—	65·7	—	Ageing; sagittal suture partly obliterated, lambdoid partly closed, coronal closing.
—	103	—	—	—	61·6	—	Ageing; sagittal suture closed. Tympanic perforation L.
124	—	—	—	—	—	—	Sagittal suture closed at obelion.
122?	113	—	—	—	61·4	—	Single wormians in lambdoid suture R. and L.
111·5	—	—	—	—	—	—	Wormian in lambdoid L.
121·5?	106?	—	—	—	64·4?	—	Asymmetrical.
115?	106?	—	—	—	63·5?	—	Wormian in lambdoid L.
—	—	—	—	—	—	—	Aged; sagittal and coronal sutures closed.
119	110	—	—	—	60·2	—	Wormian in lambdoid suture L. Complex sutures.
—	—	—	—	—	—	—	Aged; sagittal and coronal sutures closed. Small ossicle in coronal L.
—	107	—	—	—	57·6	—	Sagittal suture closed. Wormian in lambdoid L. Metopic LF + RP. Epipteric bone (missing) Tympanic perforation R. and L. Asymmetrical.
113	102	—	—	—	61·1	—	——
111	—	—	—	—	—	—	Aged; sagittal suture nearly obliterated, coronal and lambdoid nearly closed.
—	103?	—	—	—	65·0?	—	Sagittal suture closing.
121	108	—	—	—	63·3	—	Wormians in lambdoid suture R. and L. Epipteric bone L.
123	101·5	—	—	—	57·1	—	Sagittal suture closed at obelion, lambdoid and coronal closing. Projecting occipital.
—	114	—	32·4	27·4	58·7	84·6	Tympanic perforation L. Basal suture not obliterated.
115	108	—	—	—	58·2	—	Wormian in lambdoid suture L.
116?	103	—	31·2	23·9	62·9	76·6	Wormians in lambdoid suture R. and L. Fossa pharyngea.
—	—	—	—	—	—	—	Aged; all sutures closed. Tympanic perforation L.
108?	107	—	—	—	61·9	—	Flattening at obelion.
—	105	—	—	—	60·9	—	Ageing; sagittal suture closed, lambdoid nearly closed.
108	127	—	—	—	56·1	—	Ageing; all sutures closing. 2 large parietal foramina.
—	—	—	—	—	—	—	Sagittal and coronal sutures beginning to close. Depression at obelion.
105	118	—	—	—	57·2	—	Sagittal suture closing. Flattening at obelion.
—	115?	—	39·0	31·4	62·5?	80·5	Wormians in lambdoid suture R. and L.
—	—	—	—	—	—	—	Ageing; sagittal and coronal sutures partly closed.
—	110·5	—	—	—	60·1	—	——

No.	Sex	*IOW*	*B'*	*B''*	*B*
99A	♀?	97·5?	95·0	—	—
99C	,,	—	88·2	—	—
99D	,,	97·5	92·8	—	—
158	,,	—	—	—	139
173	,,	—	—	—	—
292	,,	—	92·0	—	—
294	,,	93·5	96·2	—	—
295	,,	—	94·2	—	—
351	,,	—	—	—	137
373	,,	—	95·7	—	140
399C	,,	—	93·3	—	—
399I	,,	—	—	—	130
490	,,	92?	94·6	—	—
496	,,	90·5	91·9	—	—
499D	,,	88	91·9	—	—
499F	,,	89·5	92·7	—	—
499L	,,	92	92·1	—	—
499N	,,	94	95·5	—	—
685	,,	93	92·0	—	—
696	,,	94·5	96·5	—	—
697	,,	93	90·4	—	—
799D	,,	—	95·8	—	—
799F	,,	—	101·4	—	—
799G	,,	—	94·0	—	—
799L	,,	—	91·8	—	—
876	,,	—	—	120·5?	—

No.	Sex	S_1	S_2	S_1'	S_1
52	♀	—	123·5	—	105
53	♀?	—	105·5?	—	94
167	,,	121	—	108·0	—
183	,,	127	—	109·6	—
186	,,	122·5	125	108·2	114
275	,,	—	124?	—	112
289	,,	117·5?	—	103·8?	—
364	,,	—	109?	—	98
381	,,	107·5?	113?	96·0?	99
387	,,	114	—	103·7	—
390	,,	—	127·5?	—	113
399	,,	—	113?	—	103
399J	,,	117·5?	—	102·4?	—
456	,,	—	115	—	106
464	,,	126	—	110·2	—
483	,,	—	121·5	—	112
565	,,	—	110?	—	98
599G	,,	119	—	105·5	—
660	♀	—	123	—	110
675	,,	—	114	—	100
687	,,	—	108	—	100
753	♀?	—	118·5	—	105
786	,,	122	—	108·0	—
787	,,	129	—	113·3	—
850	,,	—	119	—	110

. and L. Thin bones.

lambdoid open.

ambdoid R. and L.,

g.

bone (missing) L.

ital.

Appendix II. *Individual Measurements of Spitalfields Skulls.*
XII. *Female Calvarial Fragments.*

No.	Sex	*IOW*	*B'*	*B''*	*B*	*Bias-terionic B*	Remarks
99A	♀?	97·5?	95·0	—	—	—	Metopic.
99C	„	—	88·2	—	—	—	——
99D	„	97·5	92·8	—	—	—	——
158	„	—	—	—	139	110?	Numerous wormians in lambdoid suture R. and L.; 2 ossicles in coronal L.
173	„	—	—	—	—	108·5?	Aged; sagittal suture obliterated, lambdoid almost obliterated.
292	„	—	92·0	—	—	—	——
294	„	93·5	96·2	—	—	—	——
295	„	—	94·2	—	—	—	Metopic.
351	„	—	—	—	137	—	Wormians in lambdoid suture R. and L. and ossicle in coronal R.
373	„	—	95·7	—	140	—	——
399C	„	—	93·3	—	—	—	——
399I	„	—	—	—	130·5	105?	——
490	„	92?	94·6	—	—	—	Metopic; LF + RP.
496	„	90·5	91·9	—	—	—	Metopic; LF + RP 5·5 mm.
499D	„	88	91·9	—	—	—	——
499F	„	89·5	92·7	—	—	—	——
499L	„	92	92·1	—	—	—	——
499N	„	94	95·5	—	—	—	——
685	„	93	92·0	—	—	—	——
696	„	94·5	96·5	—	—	—	——
697	„	93	90·4	—	—	—	——
799D	„	—	95·8	—	—	—	——
799F	„	—	101·4	—	—	—	——
799G	„	—	94·0	—	—	—	——
799L	„	—	91·8	—	—	—	——
876	„	—	—	120·5?	—	—	Metopic; LF + RP.

No.	Sex	S_1	S_2	S_1'	S_2'	Remarks
52	♀	—	123·5	—	105·9	Os triangulare R. Wormians in lambdoid suture L.; ossicle of λ. 100 *B*/*L* ca. 100.
53	♀?	—	105·5?	—	94·8	Sagittal suture closing at obelion. Wormian in lambdoid R.; large ossicle of λ.
167	„	121	—	108·0	—	Double ossicle of λ.
183	„	127	—	109·6	—	——
186	„	122·5	125	108·2	114·4	Sutures beginning to close. Wormian in lambdoid R.
275	„	—	124?	—	112·6?	Wormians in lambdoid suture L.
289	„	117·5?	—	103·8?	—	Sagittal and coronal sutures closing. Extremely small nasal bones.
364	„	—	109?	—	98·5?	Sagittal suture closing, lambdoid beginning to close.
381	„	107·5?	113?	96·0?	99·1?	——
387	„	114	—	103·7	—	Wormians in lambdoid suture R. and L.
390	„	—	127·5?	—	113·1	Sagittal and lambdoid sutures closing, coronal open. Wormians in lambdoid R. and L. Complex sutures.
399	„	—	113?	—	103·5?	Sagittal suture almost obliterated, lambdoid closed. Wormian in lambdoid R.
399J	„	117·5?	—	102·4?	—	——
456	„	—	115	—	106·7	Lambdoid suture closing. Thin bones.
464	„	126	—	110·2	—	——
483	„	—	121·5	—	112·0	Sagittal suture beginning to close.
565	„	—	110?	—	98·8?	Sagittal suture closed, lambdoid closing, coronal open.
599G	„	119	—	105·5	—	Aged; sagittal and coronal sutures closed. Metopic; LF + RP.
660	♀	—	123	—	110·0	Wormian in lambdoid R.
675	„	—	114	—	100·0	Wormian in lambdoid L.
687	„	—	108	—	100·6	Sagittal suture closing.
753	♀?	—	118·5	—	105·6	Sagittal suture closed and obliterated at obelion.
786	„	122	—	108·0	—	Aged; sagittal and coronal sutures closed.
787	„	129	—	113·3	—	——
850	„	—	119	—	110·0	All sutures closing. Wormian in lambdoid R.

; 2 ossicles
obliterated.

ossicle in

ssicle of λ
d R.; large

asal bones.

Vormians in
Wormian in

+RP.

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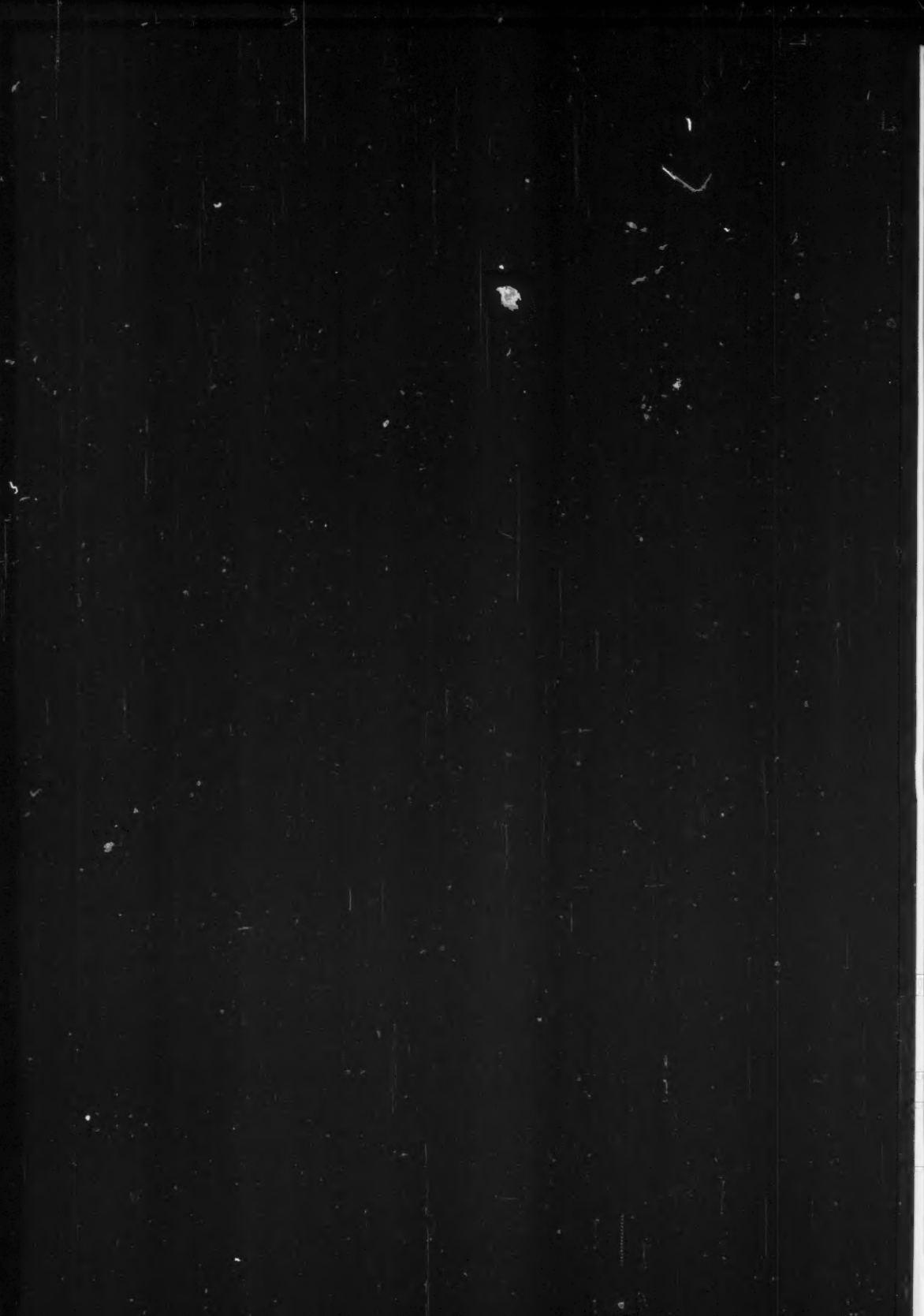


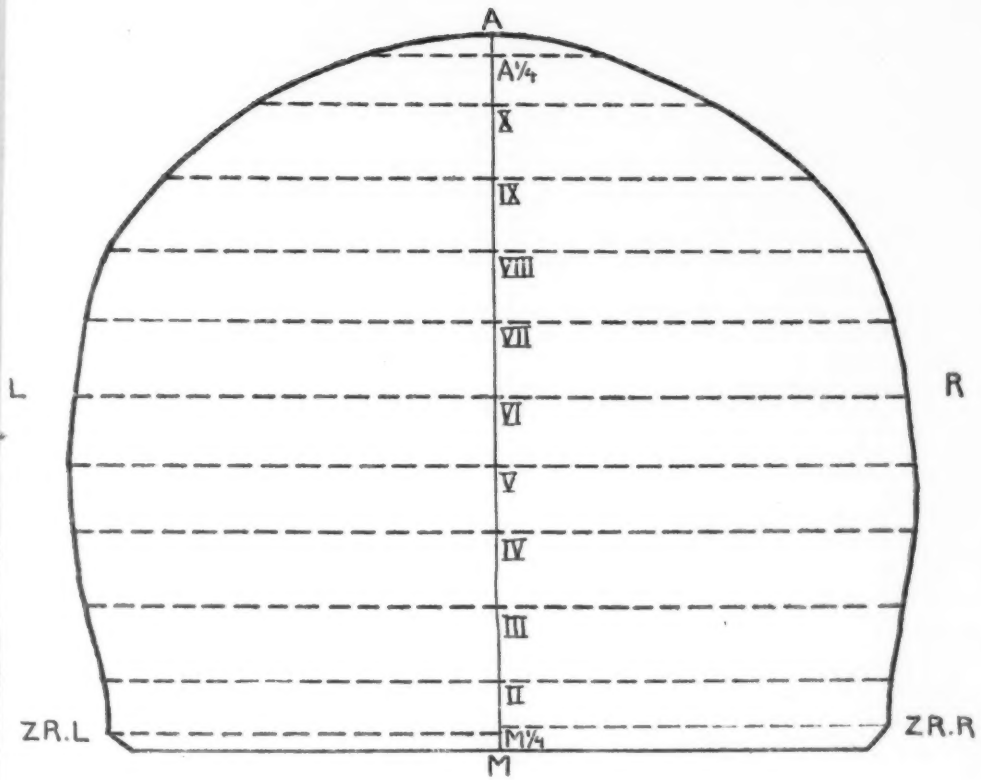
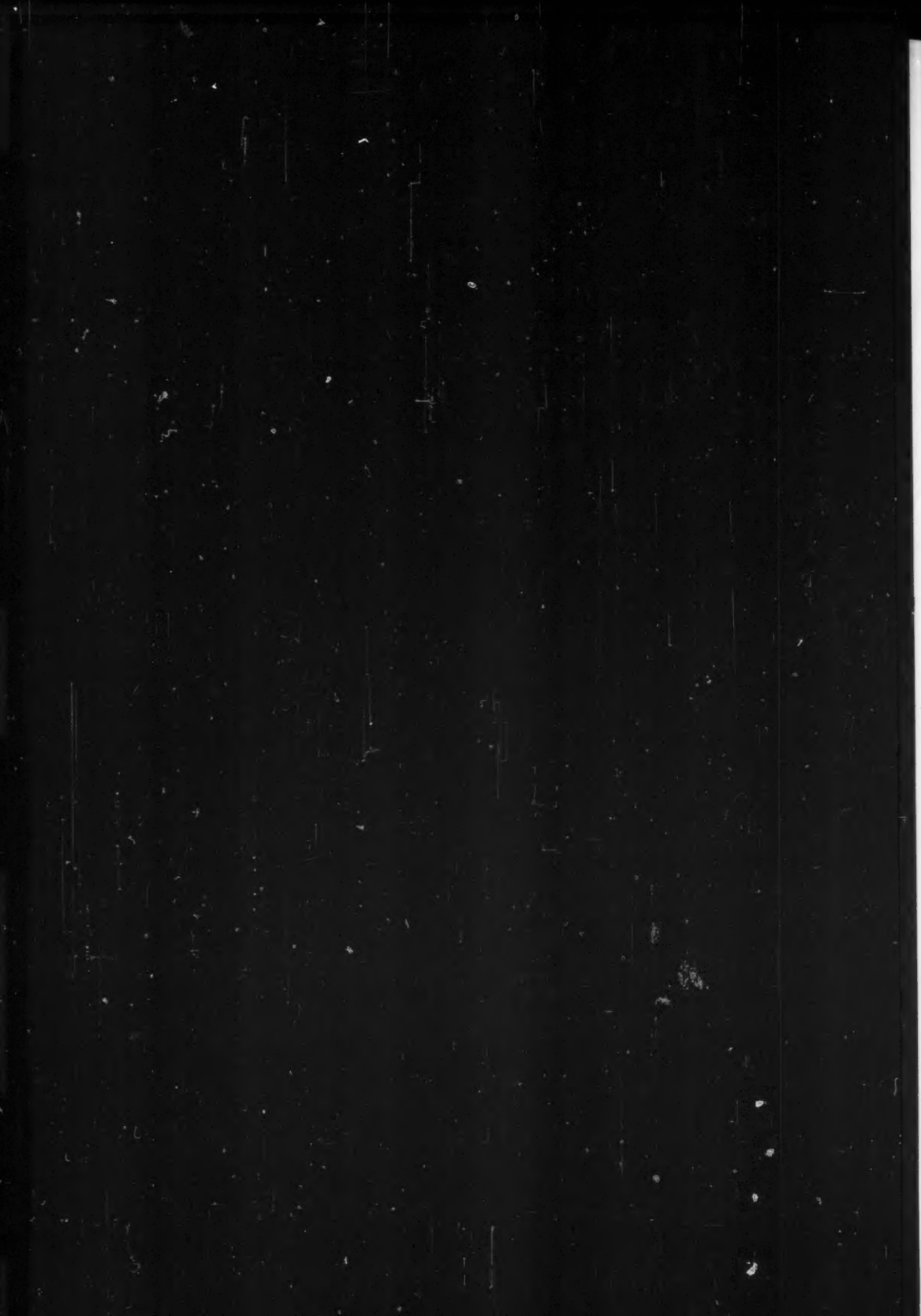


Fig. 2. Dajaks ♂ (30). Transversale Typen Kontur.



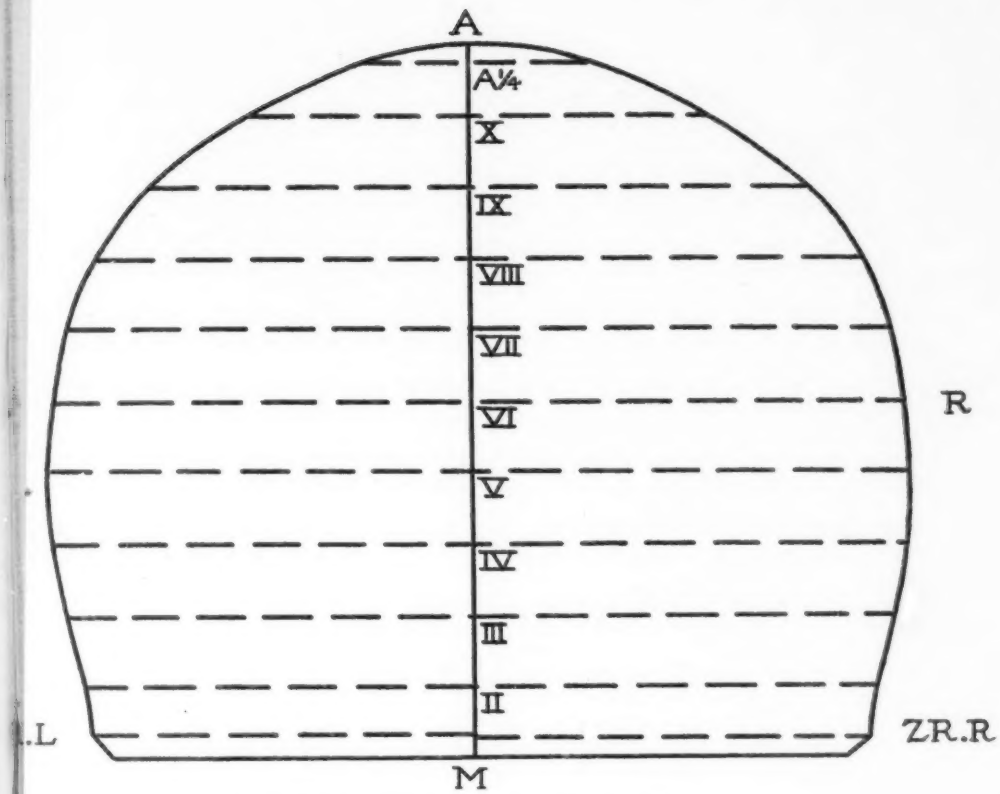


Fig. 3. Bantam-Batavia ♂ (53). Transversale Typen Kontur.

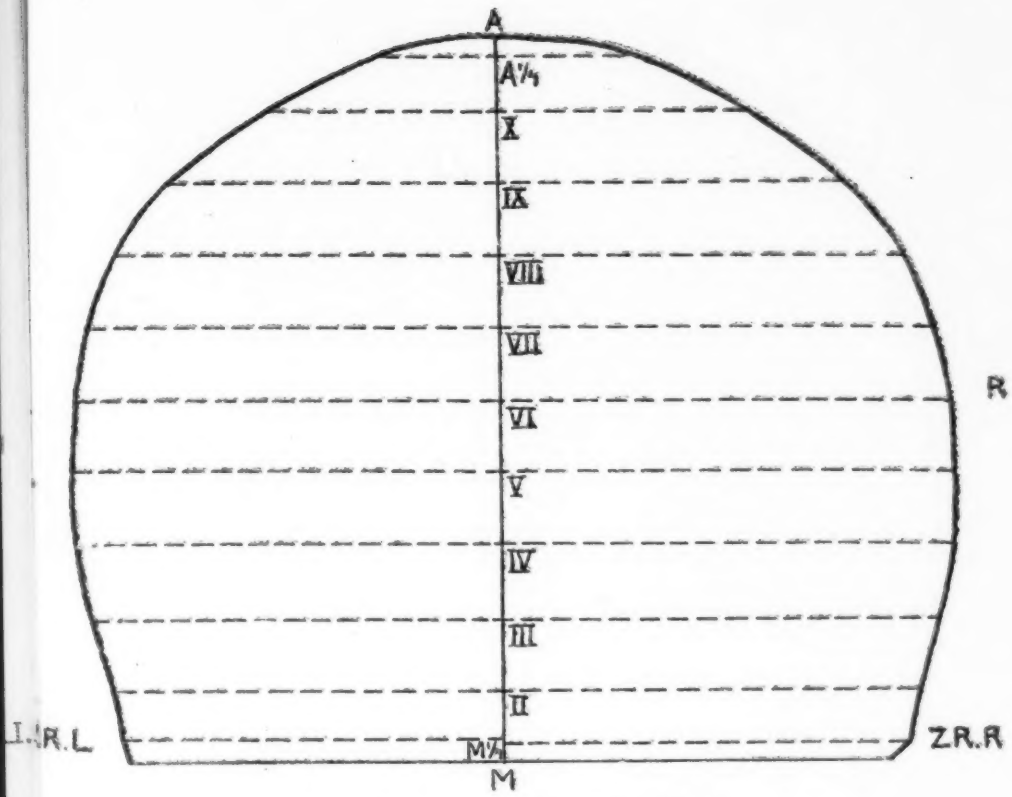


Fig. 4. Mittel-Java ♂ (30). Transversale Typen Kontur.

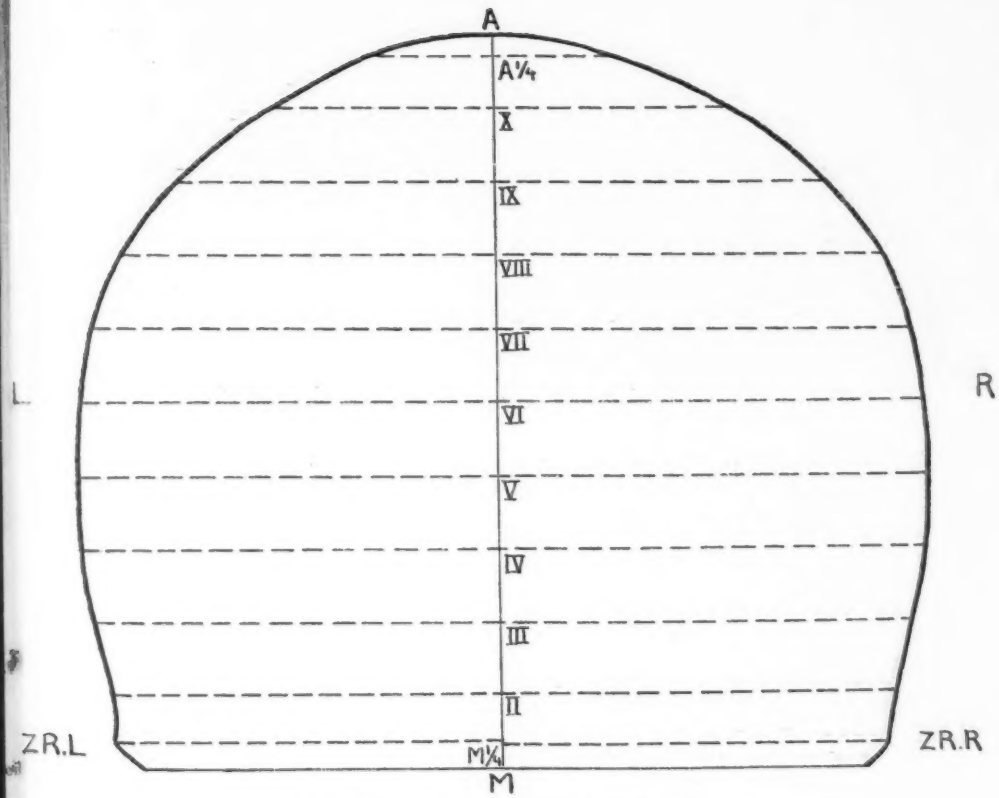


Fig. 5. Tagalen ♂ (29). Transversale Typen Kontur.

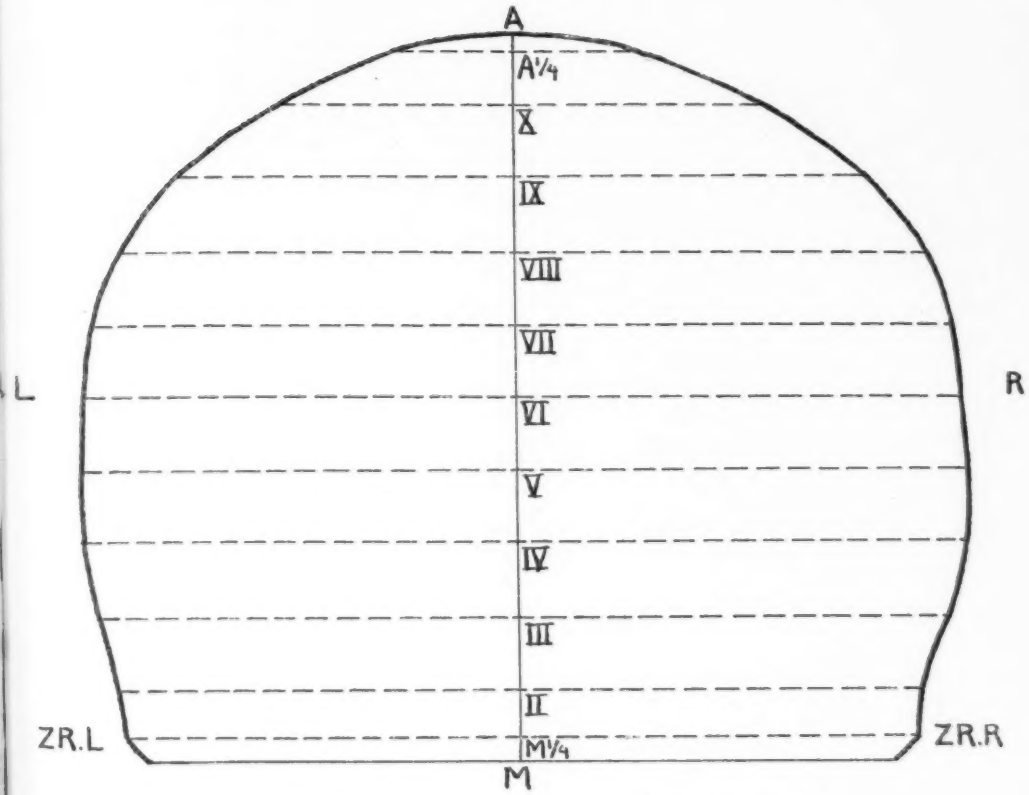


Fig. 6. Aëtas ♂ (30). Transversale Typen Kontur.

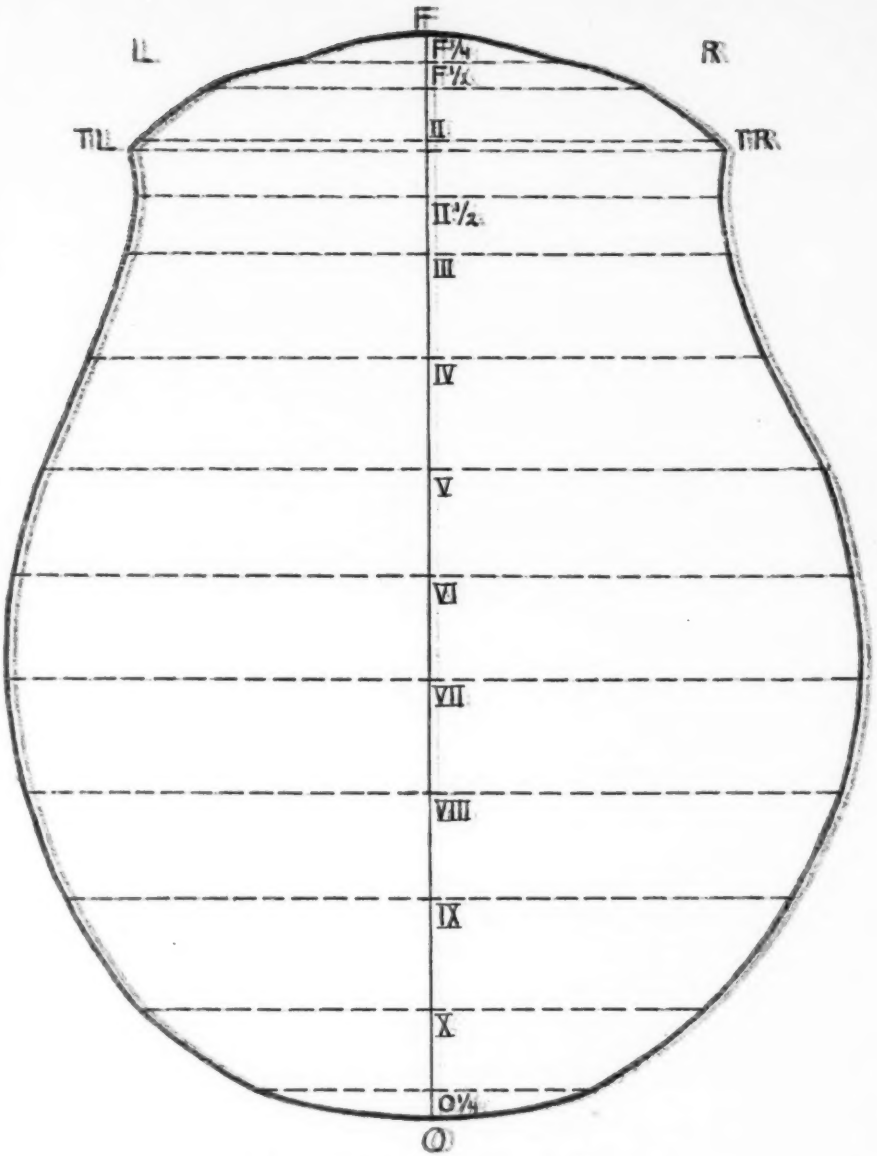


Fig. 7. Dajaks ♂ (30)○ Horizontale Typen Kontur.

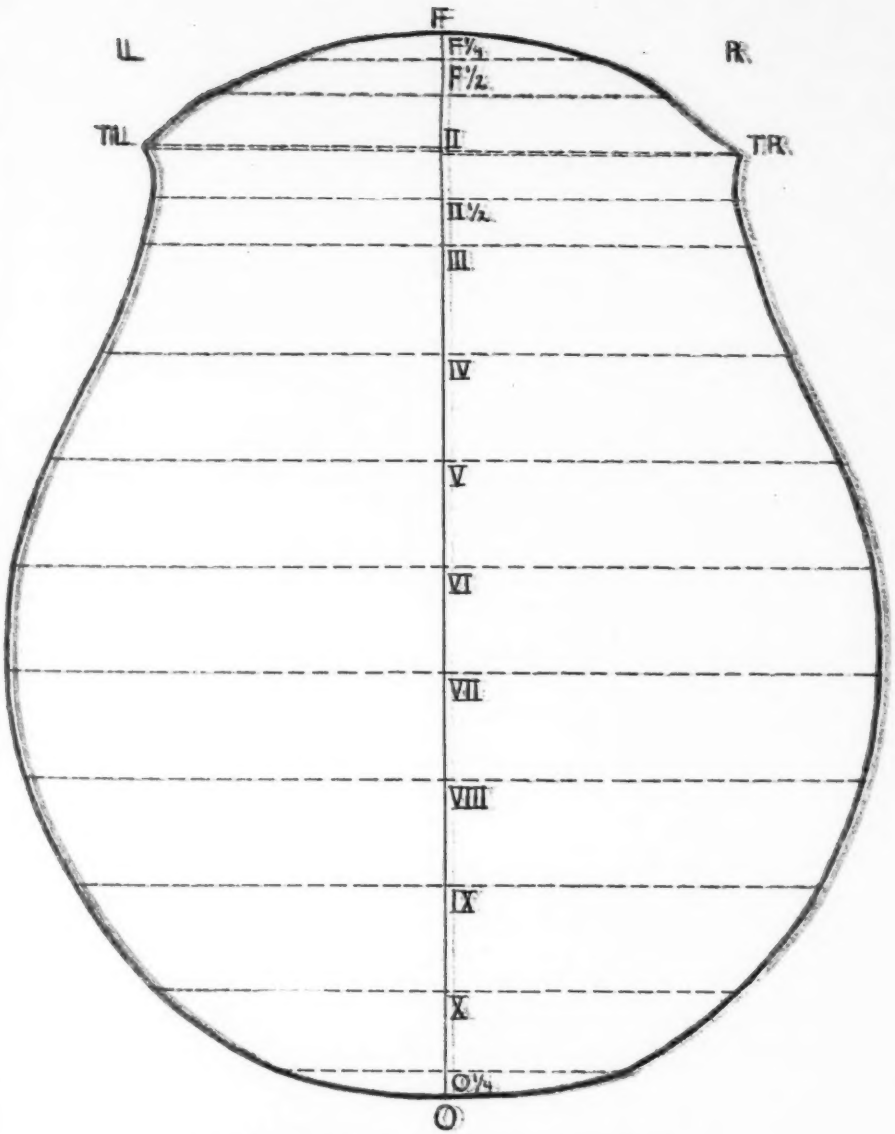


Fig. 8a. Bantam-Batavia ♂ (54). Horizontale Typenkonturen.

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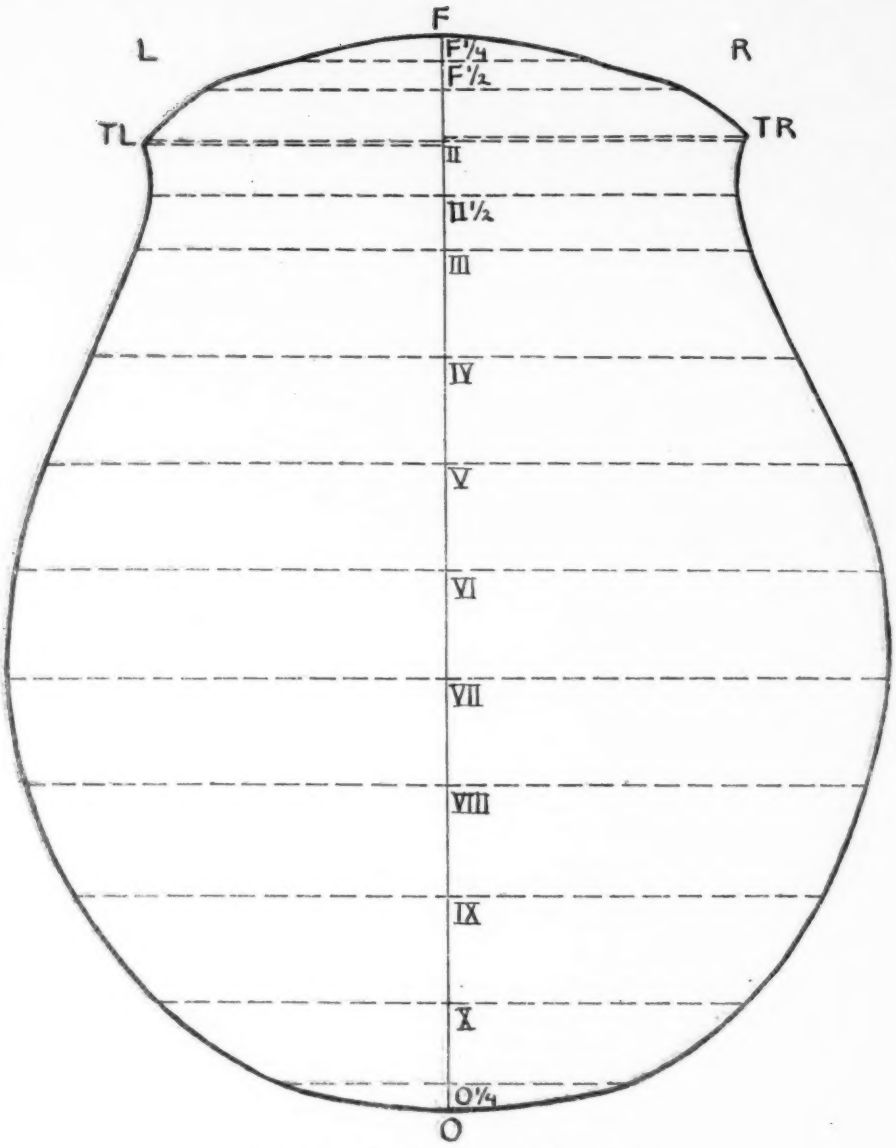

Fig. 9. Mittel-Java ♂ (30). Horizontale Typen Kontur.

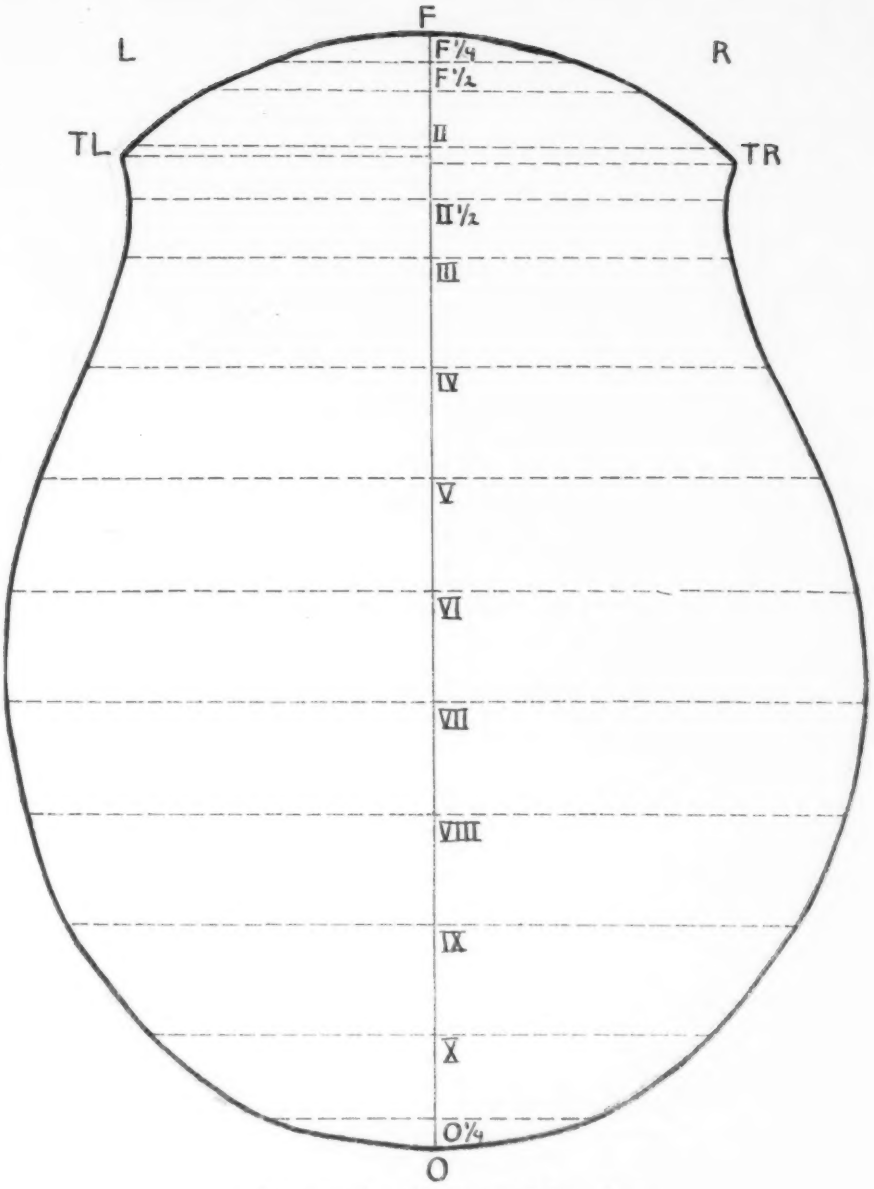

Fig. 10. Tagalen ♂ (29). Horizontale Typen-Kontur.

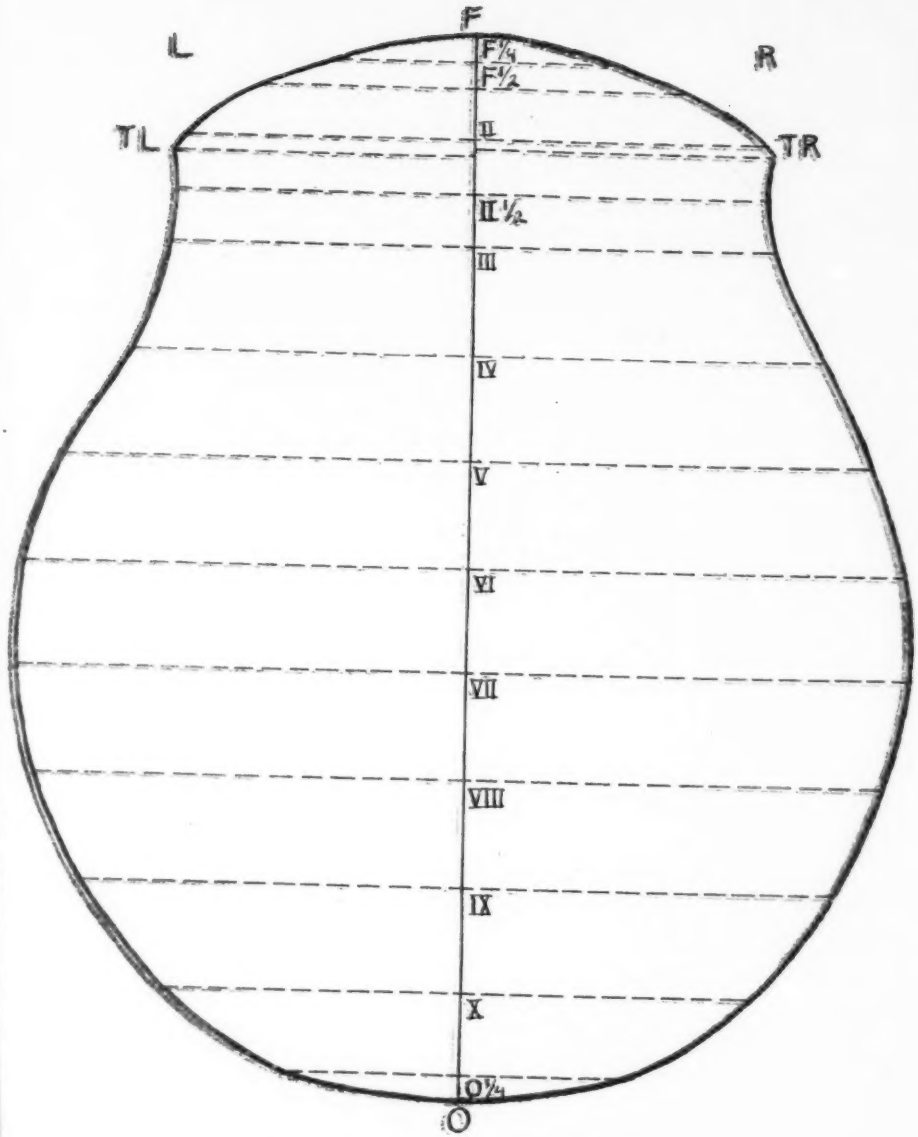

Fig. 11. Aëtas 3 (30). Horizontale Typen Kontur.

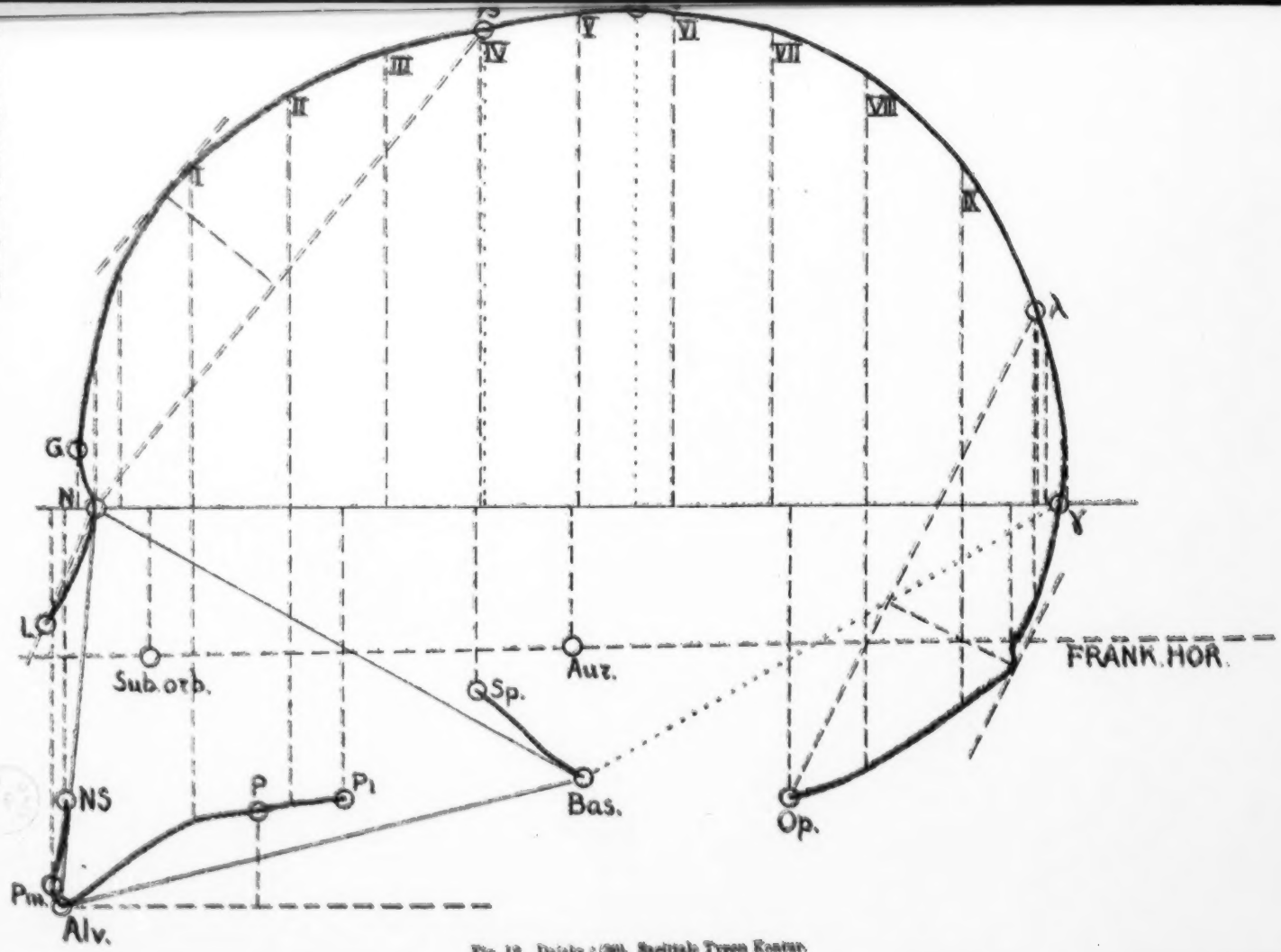

Fig. 12. Dajaks ♂ (30). Sagittale Typen Konstr.

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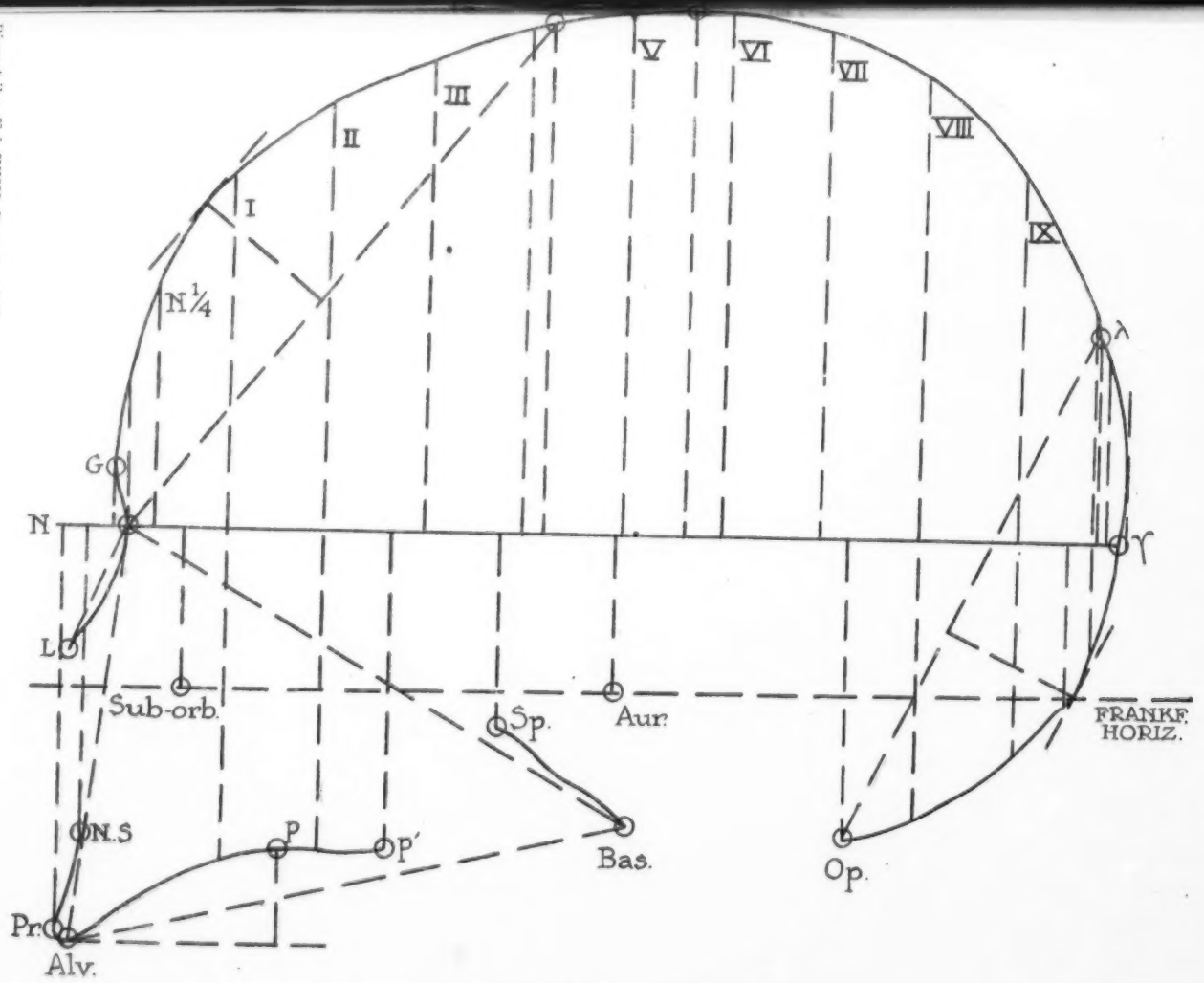

Fig. 13. Bantam-Batavia ♂ (54). Sagittale Typen Kontur.

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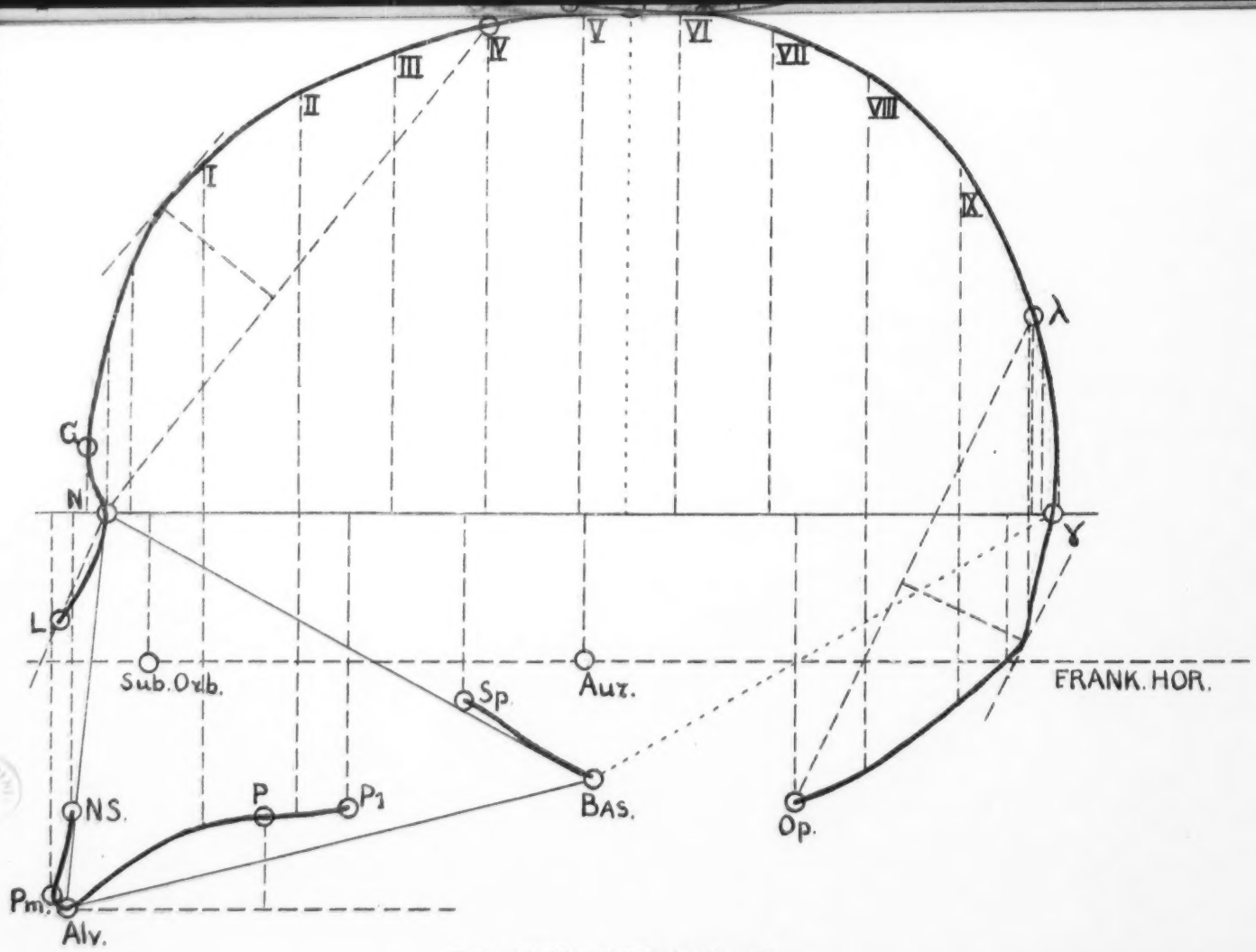

Fig. 14. Mittel-Java ♂ (30). Sagittale Typen Kontur.

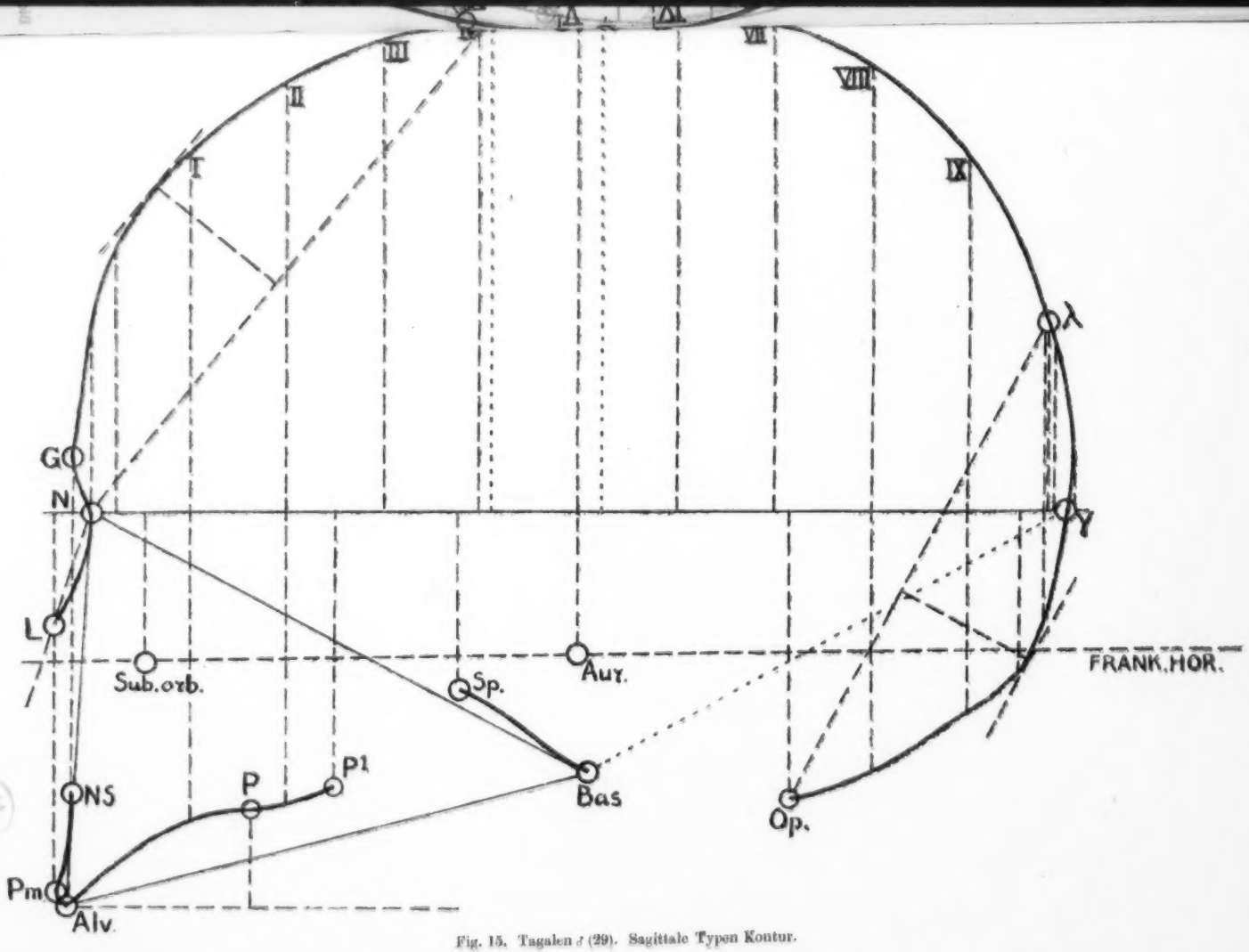

Fig. 15. Tagalen ♂ (29). Sagittale Typen Kontur.

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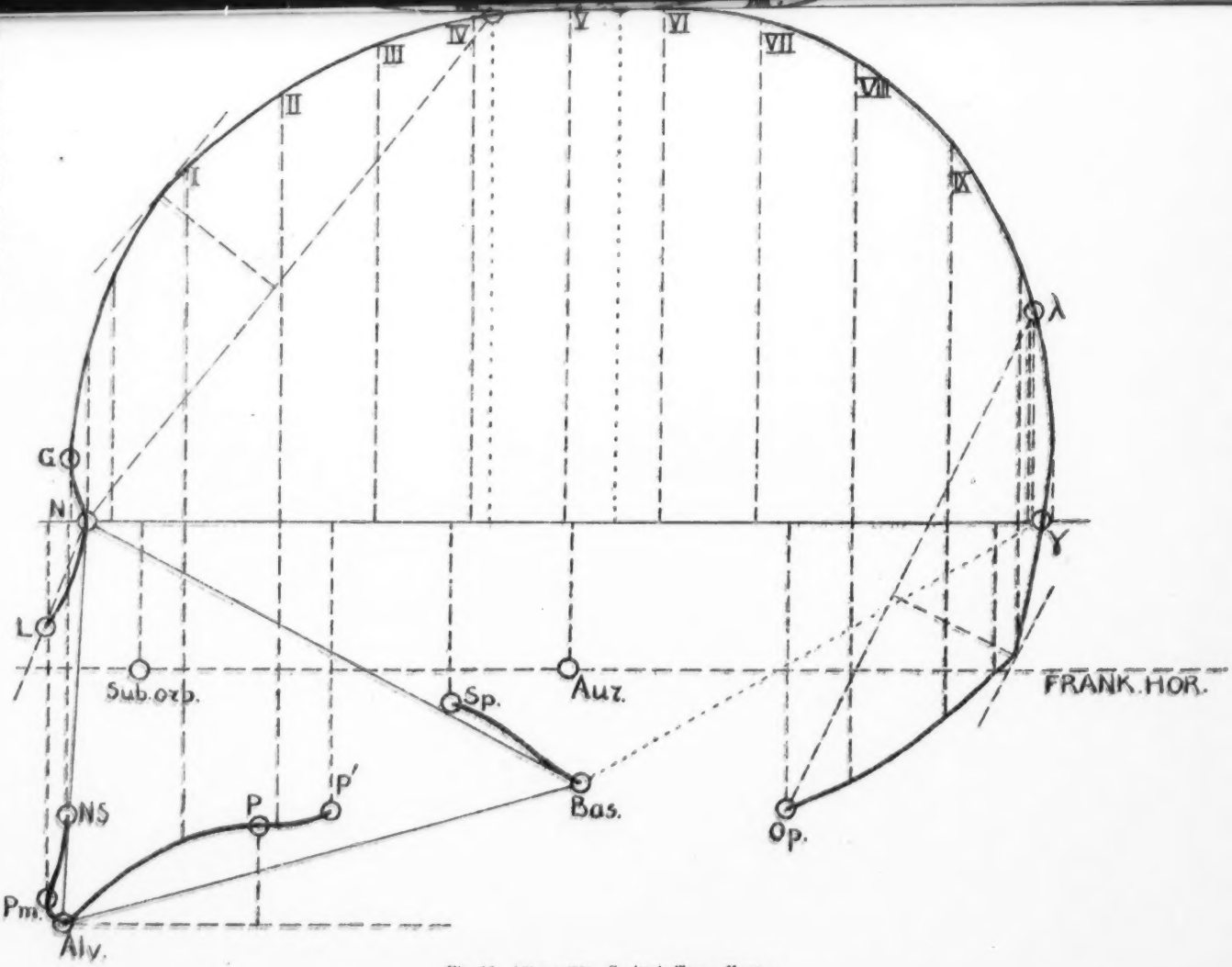

Fig. 16. Aëtas *i* (30). Sagittale Typen Kontur.

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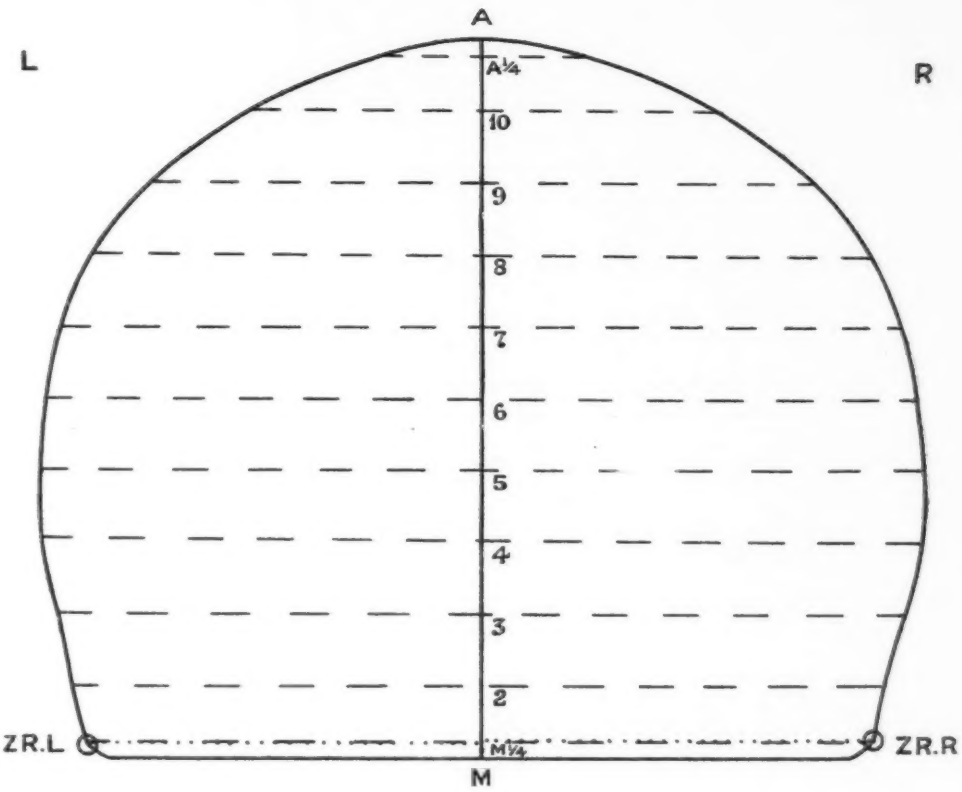


FIG VII. Spitalfields ♂ Vertical Type Contour (121 Crania)

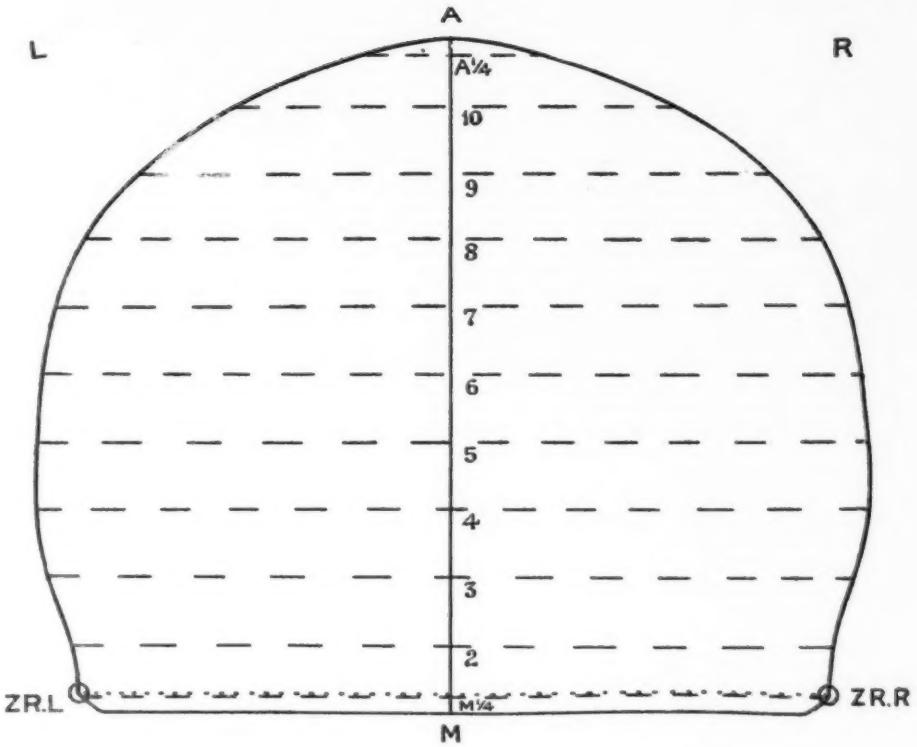


FIG. VIII. Spitalfields ♀ Vertical Type Contour (24 Crania)

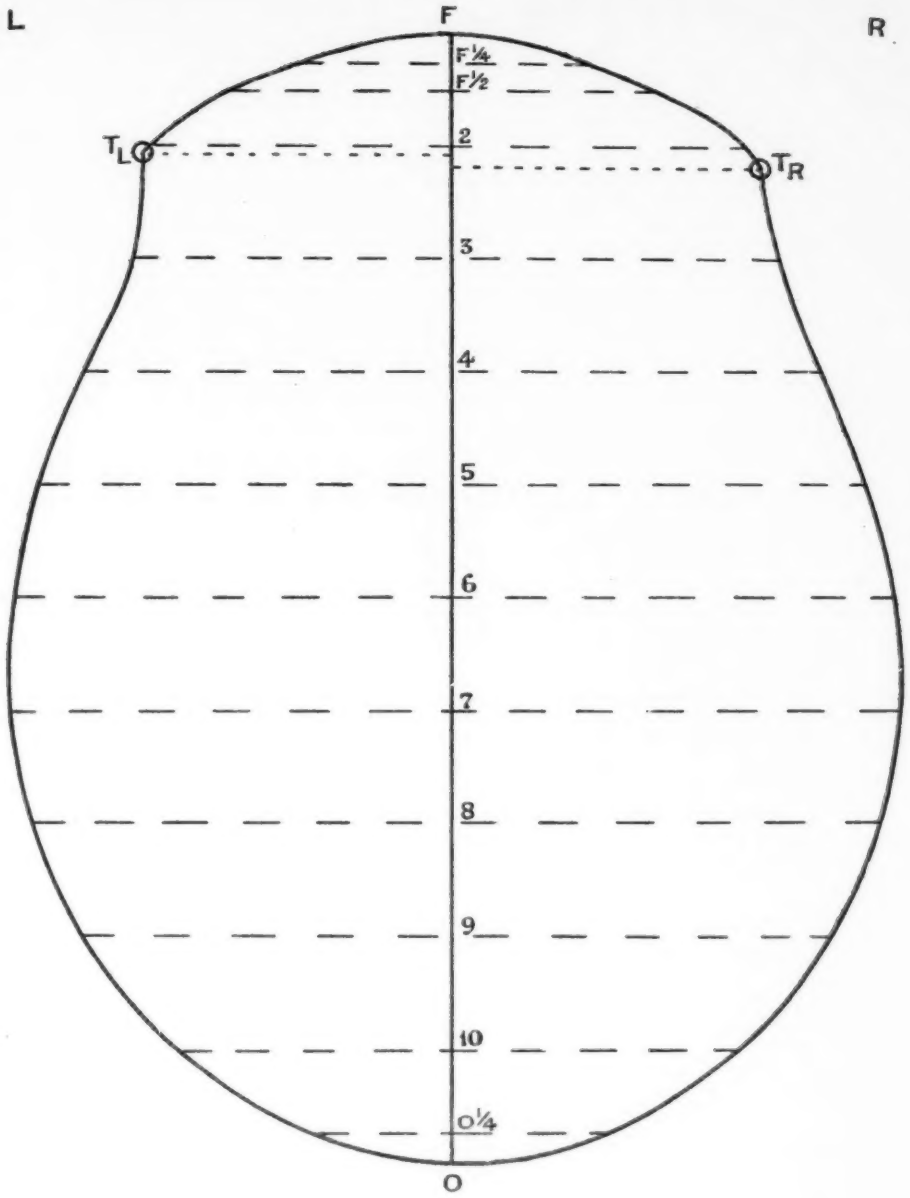
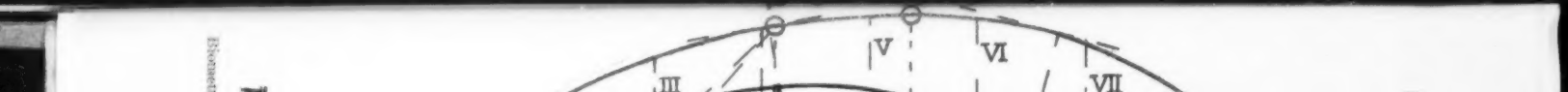


FIG. IX. Spitalfields ♂ Horizontal Type Contour (122 Crania)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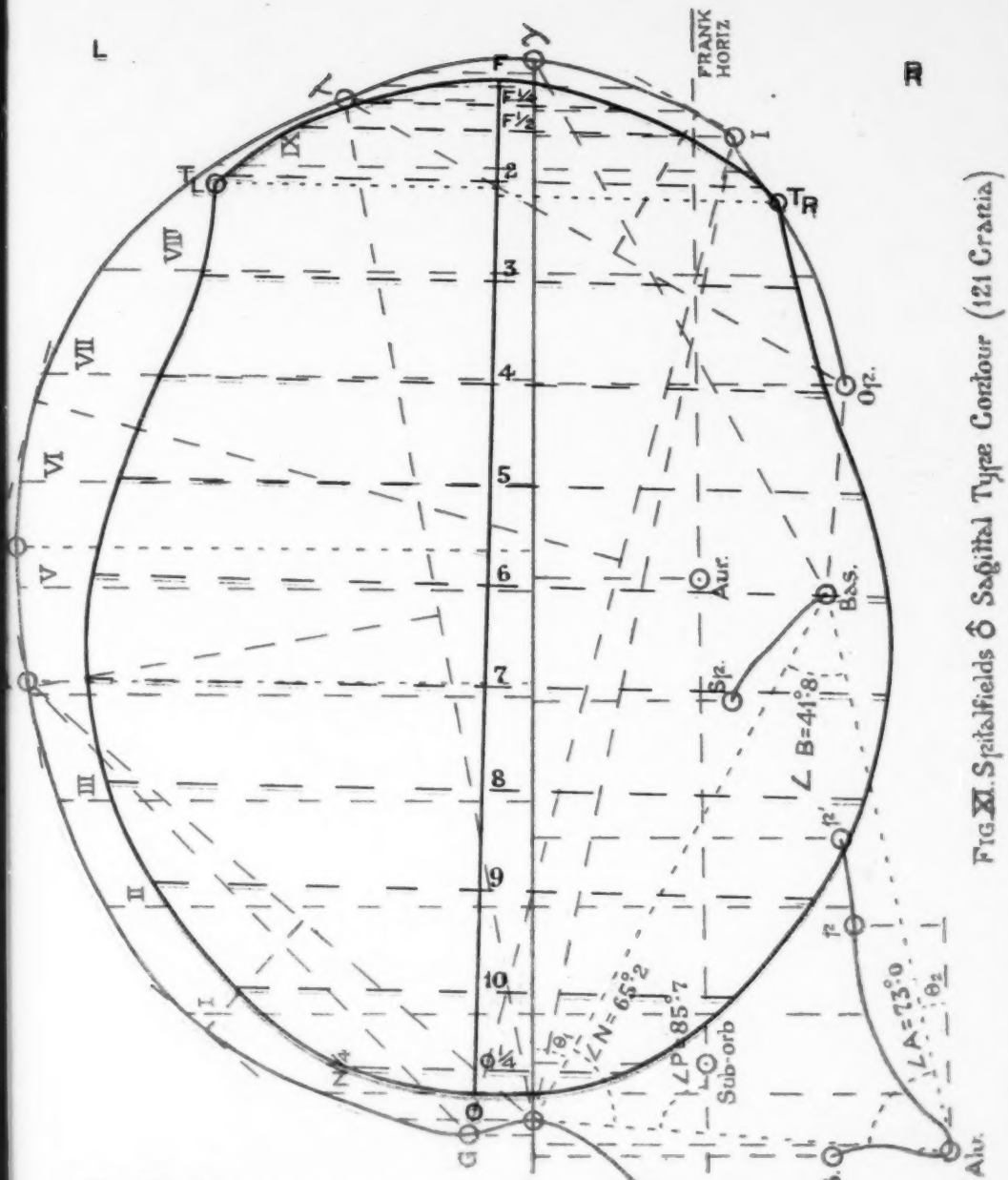

FIG. X. Spitalfields ♀ Horizontal Type Contour (23 Crania)

FIG. XI. Spitalfields ♂ Sagittal Type Contour (121 Crania)

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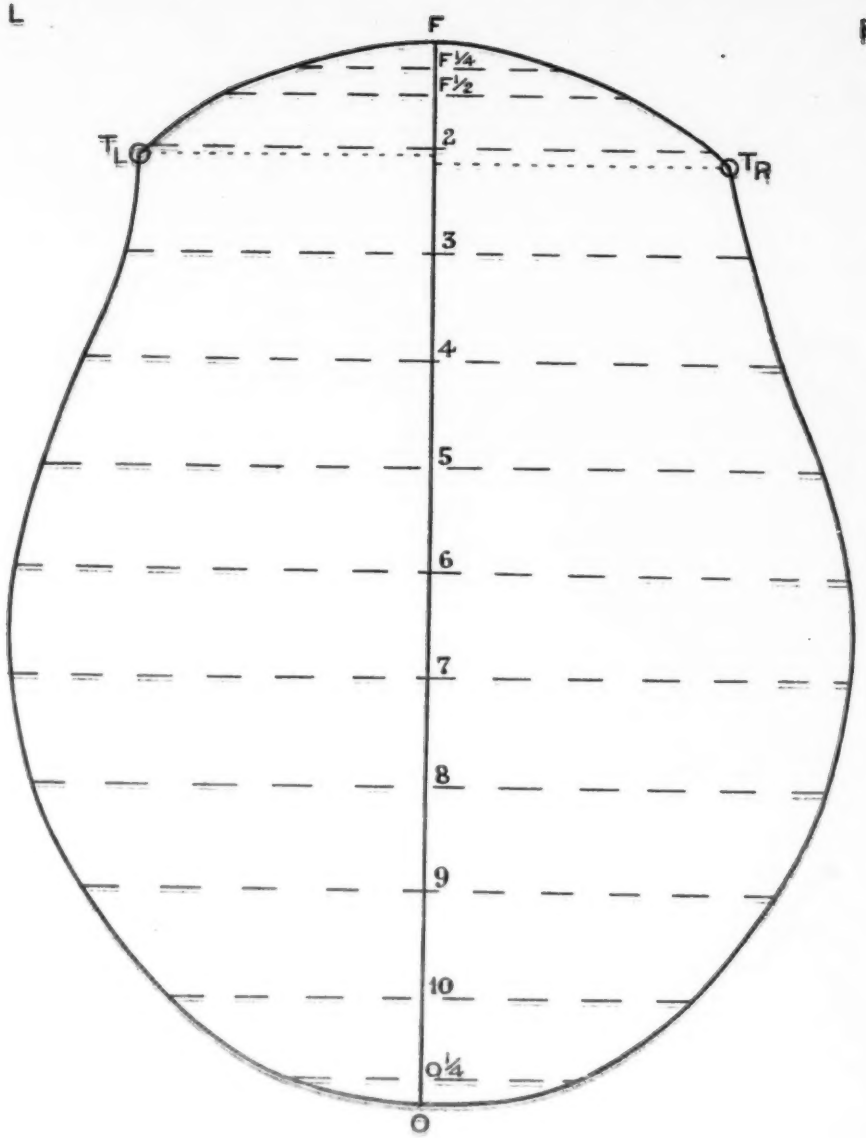

Fig. X. Spitalfields ♀ Horizontal Type Contour (23 Grazia)

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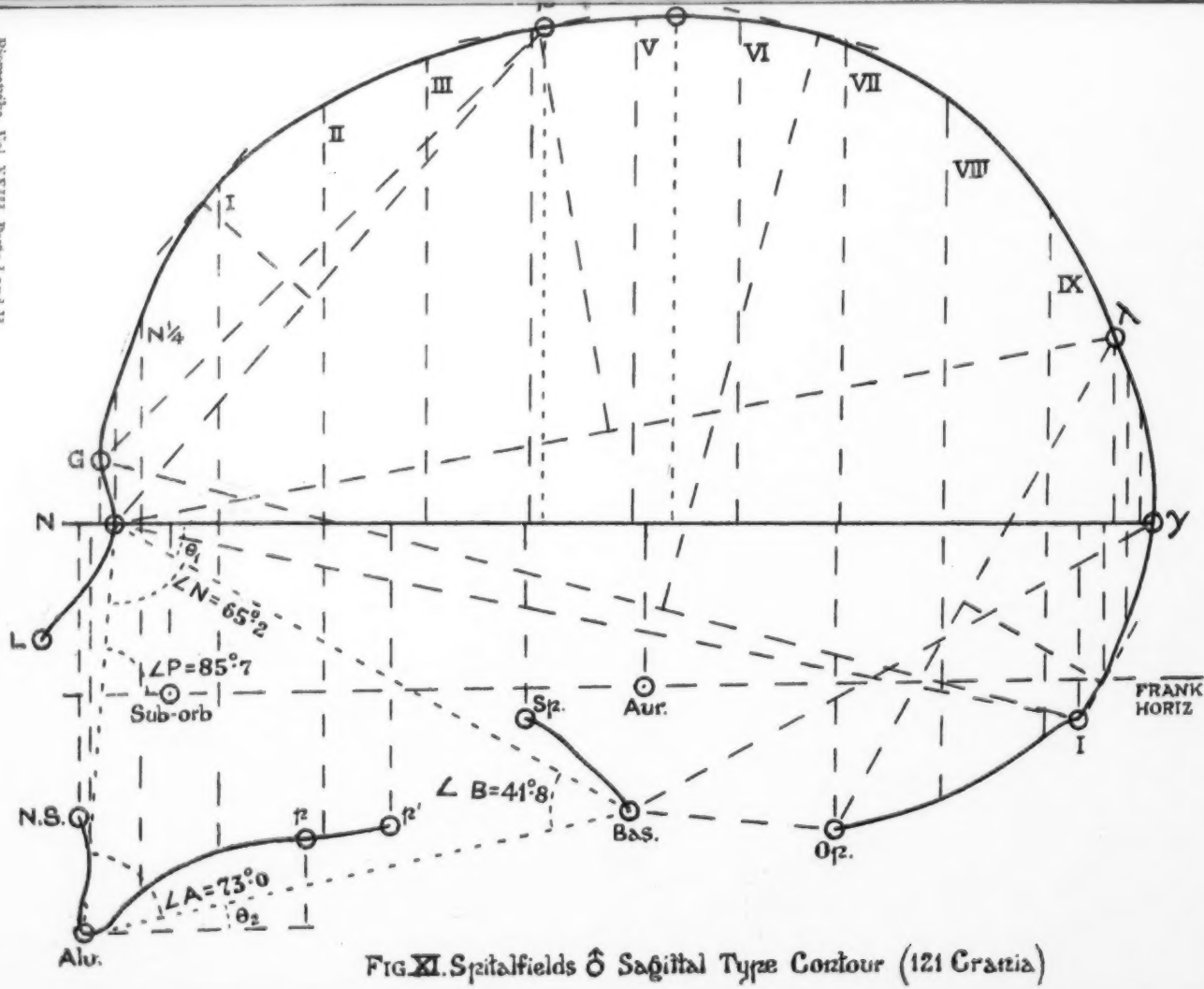

FIG. XI. Spitalfields ♂ Sagittal Type Contour (121 Crania)

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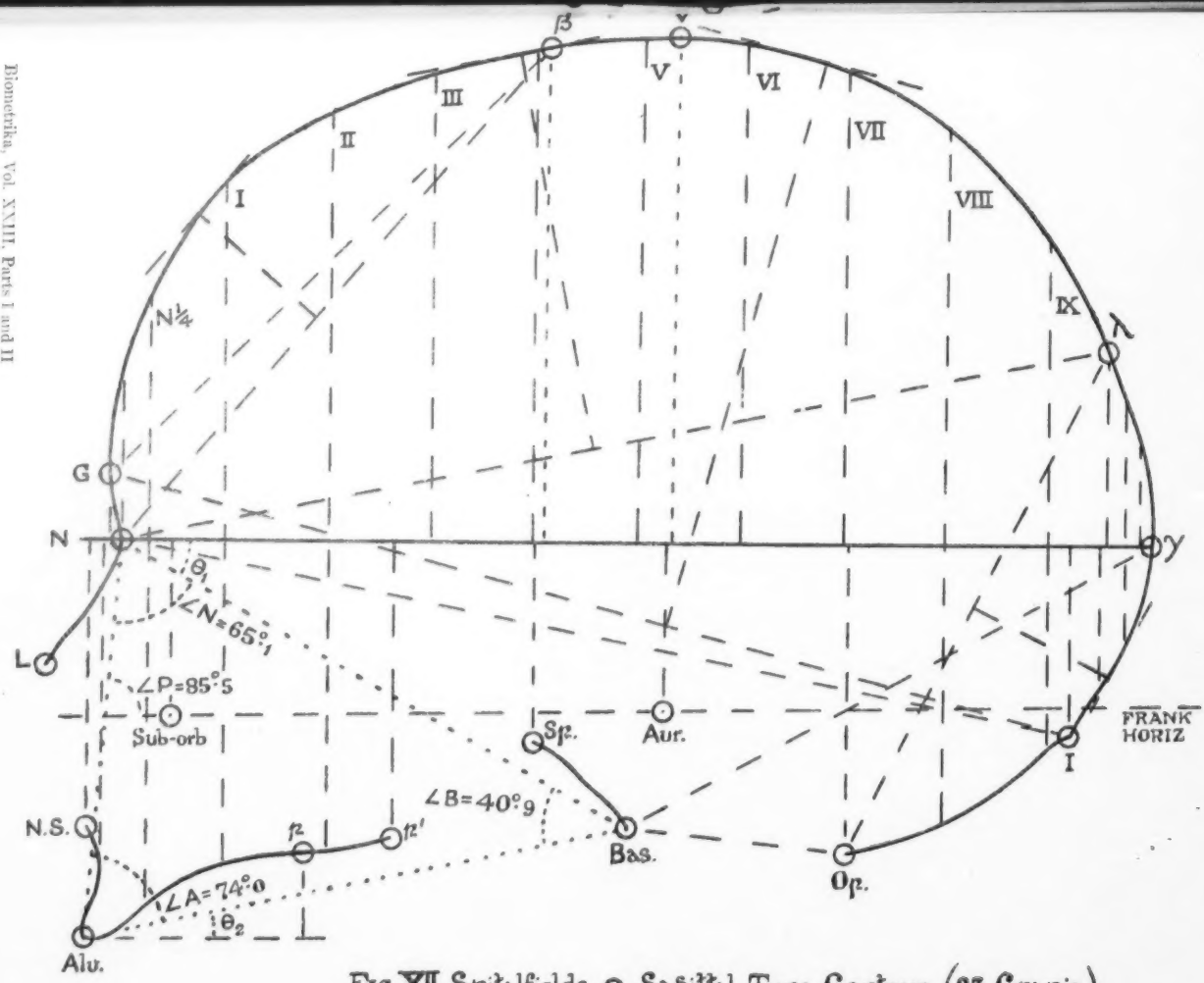

FIG. XII. Spitalfields ♀ Sagittal Type Contour (23 Crania)

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